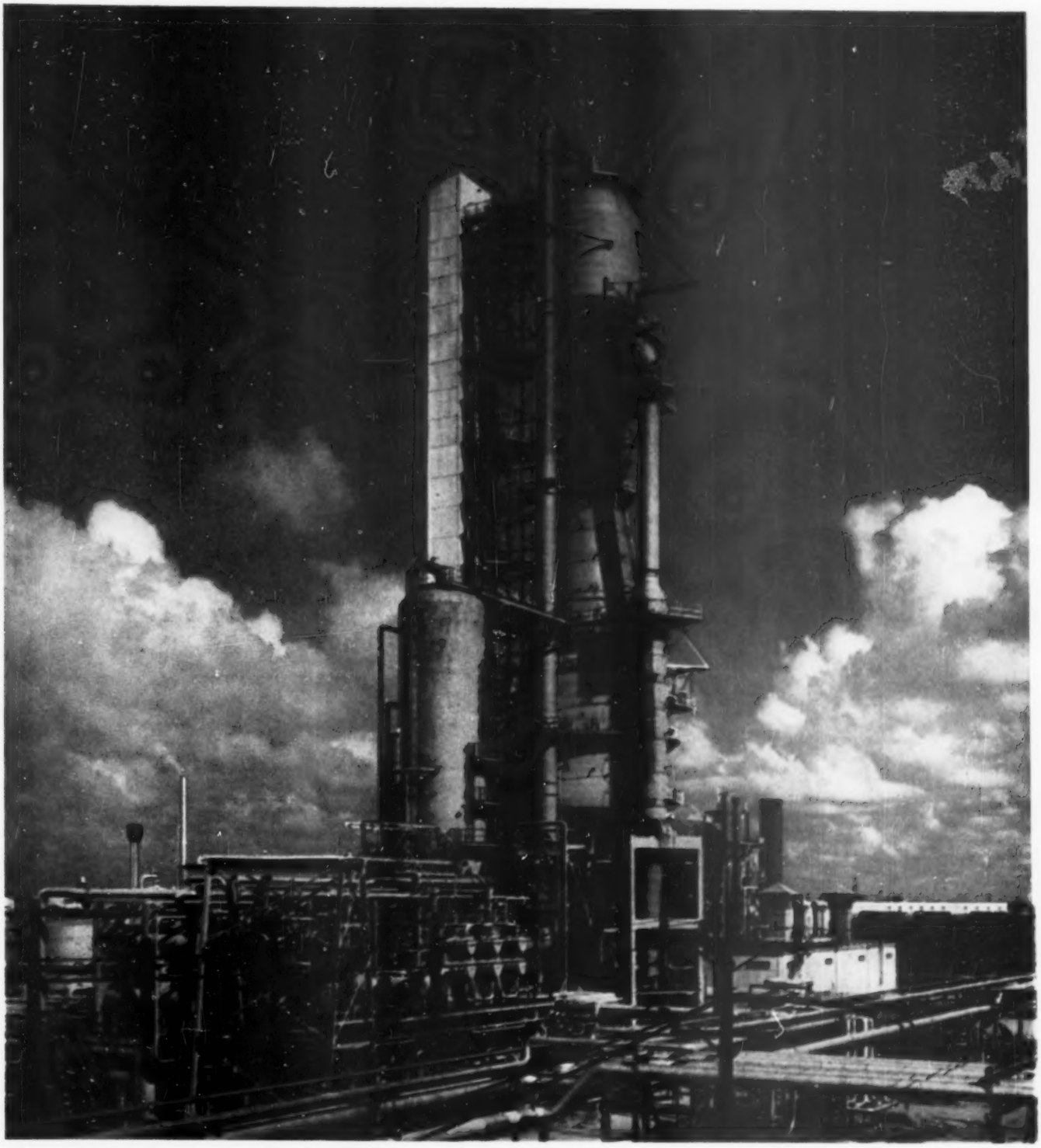
# WORLD PETROLEUM

JANUARY 1959



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# World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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THIS MONTH'S COVER

Recently completed fluid catalytic cracking unit at a Gulf Coast refinery. Color photograph by Robert Yarnall Richie for Foster Wheeler Corp., prime contractor in the erection of the new unit. The new 265-foot cracker has a rated capacity of 55,000 barrels per stream day.

# Washington PIPE LINE

by Joseph B. Huttlinger

### What's Up for Oil in '59?

The American petroleum industry looks to the opening of the 86th Congress, January 7, with more concern than at any opening in several decades. Oil is, at this time, one of the favorite targets or whipping boys of so-called "liberals" in the Senate, and there are more liberals than in many years, both in the Senate and the House of Representatives. Further, oil's economic health depends, to a great extent, upon special legislation, tailored to meet oil's needs, which has been enacted by the Congress, or which is sought to be enacted by oil-industry leaders. The so-called liberal bloc is out to end some of the special legislation, and to prevent passage of any new legislation.

The Congress is likely to consider in the coming year a natural-gas bill, the depletion allowance, oil imports, oil pipelines, oil shale, the Interstate Oil Compact, use of the Connally act to slow down oil imports, higher gasoline taxes, antitrust bills, scrutiny of price rises, construction of $225 million in helium plants, and a rash of bills which could have a widespread impact upon oil marketing. Further, the tax rate on USA oil operations outside the United States is likely to come in for attention, if only as a compromise when the Congress is asked to shave down the depletion allowance for oil operations at home and abroad.

The makeup of the 86th Congress, which will run for two years, promises to be far less kindly toward oil's aims than was the makeup of the 85th Congress which just came to an end. A man-by-man analysis shows a heavier dose of persons out to protect the consumer, and fewer out to defend the rights of free enterprise. And protection of the consumer, as it works out, often means hobbles and restraints on business. The oil business, being one of the largest, is a natural target.

While the friends of oil are in both parties—in fact two of the greatest are House Speaker Sam Rayburn of Texas and Senate Majority Leader Lyndon Johnson of Texas—the gain of seats by the Republicans is less than cheering to oil leaders. Although the geography of a senator's or house member's district usually plays a larger role in his thinking about oil matters than his party, oil men have found conservative Republicans friendly by and large. This is particularly true in areas, such as the Midwest, which have little oil production.

The makeup of the Senate and House, by party, shapes up like this:

| | 85th Congress | 86th Congress | Change |
|---|---|---|---|
| Senate | | | |
| Democrats | 49 | 64 | +15 |
| Republicans | 47 | 34 | −14 |
| | 96 | 98 | |
| House of Representatives | | | |
| Democrats | 235 | 283 | +48 |
| Republicans | 200 | 153 | −47 |
| | 435 | 436 | |

There will be one more member of the House and two more members of the Senate in view of the admission of Alaska as a state.

### Alaskan Naval Reserves

Naval Petroleum Reserves officials are concerned about the Department of Interior leases of 16,000 acres of the Gubik oil and gas area in Alaska. Officers, restudying the situation, are wondering whether the two-mile buffer zone between the Gubik field and the Naval Petroleum Reserve No. 4 is enough to prevent drainage of the Navy's gas. "If not," an officer said, "we may be in the gas-production business, with unit development with the lessee."

### Import Program Changes

The Cabinet committee on oil imports has about decided on stiffer curbs on imports of crude and products—both by lowering the total levels allowed in, and by adding new teeth to the program. The new program now is regarded as likely to set 826,000 b/d as the total allowed into Districts I through IV, which is east of the Rockies. This total, however, would include 751,000 b/d of crude and 75,000 b/d of unfinished products, and all other products except residual oil, which would not be brought under the voluntary quota system.

Originally, Navy Captain M. V. Carson, Jr., proposed this total to include crude and unfinished oils only. Extending it to cover also gasoline, distillate, and other products, which are coming in at the rate of close to 150,000 b/d, means that much of a cut in allowed imports.

Committee members are considering asking Congress to put teeth into enforcement of the program by a change in the Connally act, which provides for seizure of oil produced in excess of state allowables. The change would be to define oil imported in excess of quotas as "hot oil," and thus make it liable to seizure. Such a change would put teeth into the oil import program where they are needed against violators of the program, but not call for making the voluntary import program mandatory for all importers. Other than use of the Connally act, officials see no alternative to enforcing the program except to make it mandatory upon all. And the program is being drafted so as to make it as fair and equitable as possible on the theory that it may have to be made mandatory. Officials say it could not be made mandatory upon a few violators of the quotas without being made mandatory upon all.

Quotas for individual companies would be based on a total number of barrels daily. A company would be allowed to decide whether to bring in the oil in the form of crude, unfinished oils, or finished products. For purposes of the program, one barrel of gasoline would count as two of crude oil. One barrel of heavier products, such as distillate, would count as one barrel of crude. Quotas to individual companies would be worked out on the basis of a formula, and the formula would have two parts—the history of a company's imports, and its refinery activity.

First step in determining a company's quota would be to take a certain percentage of the total quota—60% is the figure favorved—and parcel it out among companies on the basis of each company's past imports. The second step would be to take the remaining part of the quota and parcel it out on the basis of a company's refinery activity—either crude runs or crude capacity. Any refinery which seeks an import quota would be eligible to obtain it out of the second part of the formula. There would be no minimum quota, say 100 b/d or 500 b/d, as proposed by some small refiners.

The final program is likely to include allocations to companies importing into the West Coast of about the present allowed levels—221,000 b/d. The West Coast allowable is being based on the difference between consumption and production on the West Coast. That area is bringing little trouble, as virtually all companies wishing to import have been given quotas. Districts I through IV, however, see nearly 100 refiners wanting to join the ranks of the importers.

The program being shaped up allows no quota to a company on the basis of its foreign production—only allowing quotas to USA refiners. The theory is that a company with production abroad can find a buyer with a refinery to import the crude. A refiner not physically able to use the imported crude in his own plant still could receive a quota, if he seeks it, and he would be allowed to exchange it for domestic crude. But it would have to be a straight exchange, for selling of an import quota, or a license to import crude would be forbidden.

The new program would bring all oil imports, except residual, under the quota program. Officials feel that residual oil is coming in only as a demand for it exists. Further, they explain, the price of residual oil has been higher, in terms of heating value, than the price of coal, thus cutting the ground from coal's arguments that residual is hurting the coal industry. Further, officials feel that residual is being imported only by a relatively few, although they admit jobbers have joined the ranks of residual imports in past months.

One point yet to be worked out is whether the program should allow an exemption from the quota for the asphalt content of imported crude oil. This was proposed by Carson last September. The program aims to provide for appeals by importers for a larger quota on the basis of hardship under the formula. Officials feel such appeals can be taken care of within the overall total quota, since some entitled to a quota will not be using it.

Canadian crude imports will have a special exemption, allowing an estimated 75,000 b/d to continue to come in. The program provides that Canadian crude can be imported when it is not economically or otherwise feasible to use domestic crude. Thus, winter freezes close river routes to the USA northern tier refineries, the usual users of Canadian crude. There are other ways to obtain Canadian crude for the northern plants.

Some US officials who had taken a dim view of the entire effort to limit crude imports have changed their views during the studies of the past few months. They now see that imports could rise very rapidly if uncontrolled. In fact, some see USA crude production being cut in half in a short time with uncontrolled imports of crude and products. They point out that Venezuela could increase her output very rapidly by one million barrels daily. This, they explain, would leave the USA in a bad way in case of emergency, depending upon foreign crude oil. They add that Germany had nearly 90 submarines at the start of World War II, and did a great deal of damage to oil tankers with them. And, they add that Russia is reported to have 450 submarines today, which could do that much more damage. With US oil-fields production cut way back, it would take many months and perhaps years to get production up to the point needed to make up the gap left when imports would be cut off, the officials point out. They say it takes 18 months from the time of discovery of a sizable well to get it into commercial production.

A tariff approach, proposed by some in the industry, is winning a dim reception in official circles on the grounds it would strike hardest at certain sources of crude imports. Thus, it would effectively bar Canadian crude to the USA and cut down on Venezuelan crude imports. Officials hesitate to do anything to keep out Canadian crude on the grounds that Canadian oil is a safe source in the event of war. On the other hand, officials hesitate to exempt all crude coming to the USA by pipeline on the grounds this would give favored treatment to oil from one country, Canada, against crude from South America.

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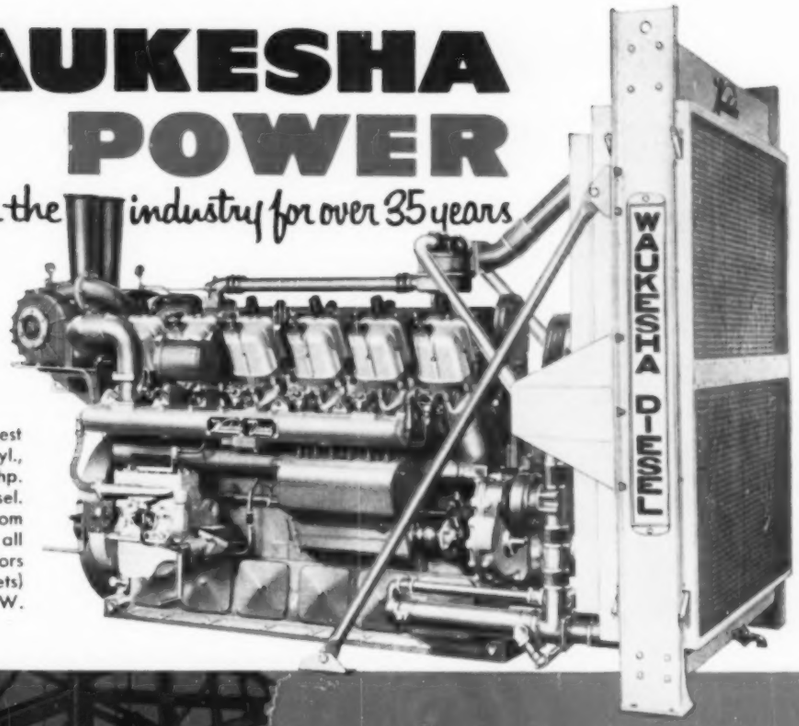


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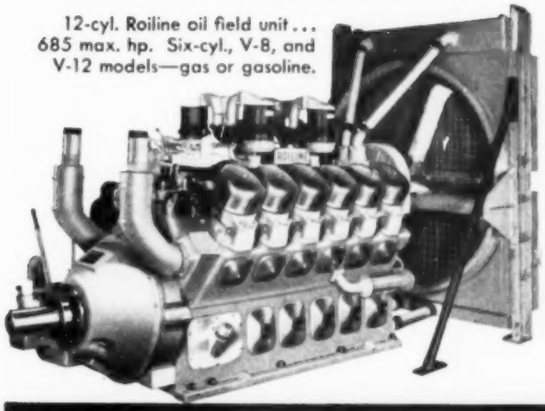
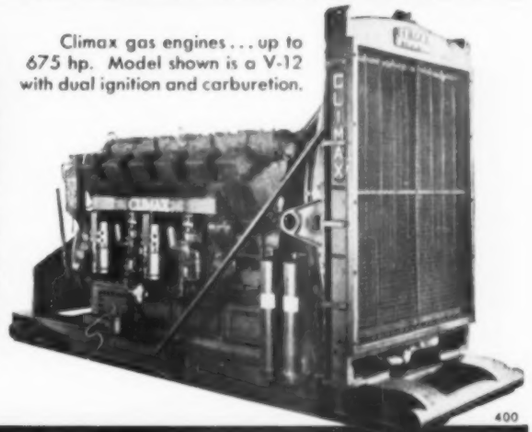


Climax gas engines . . . up to 675 hp. Model shown is a V-12 with dual ignition and carburetion.



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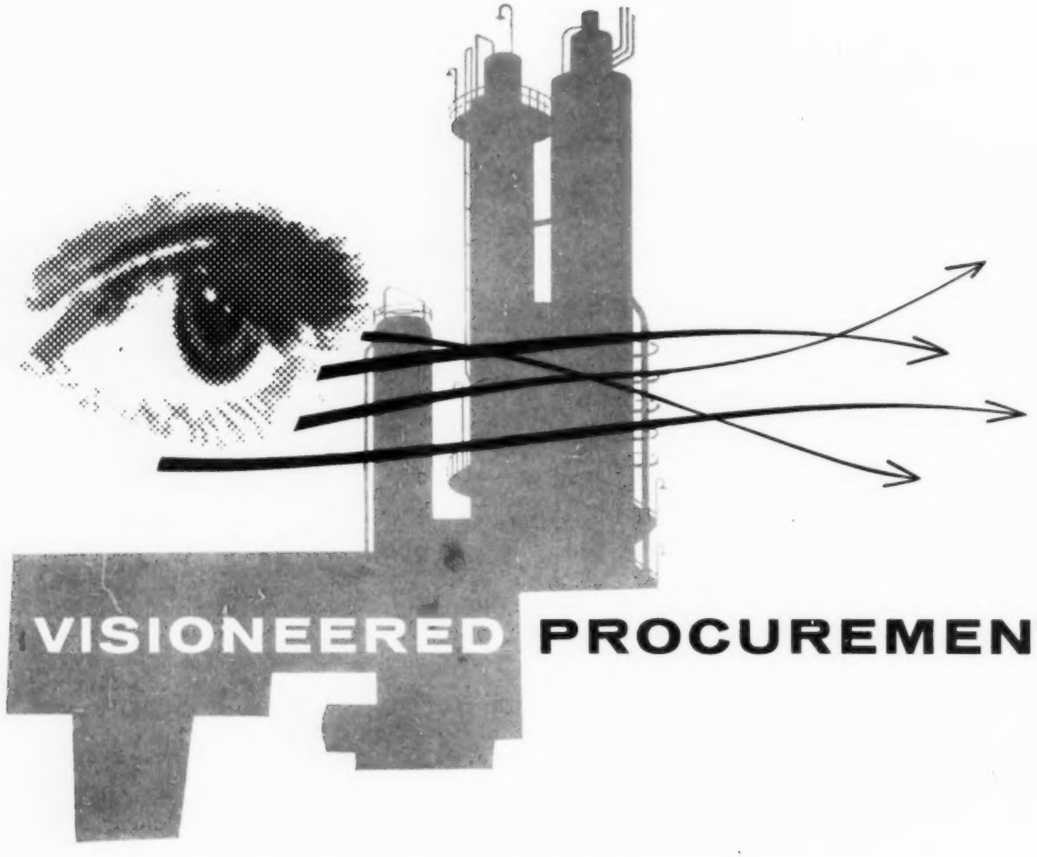

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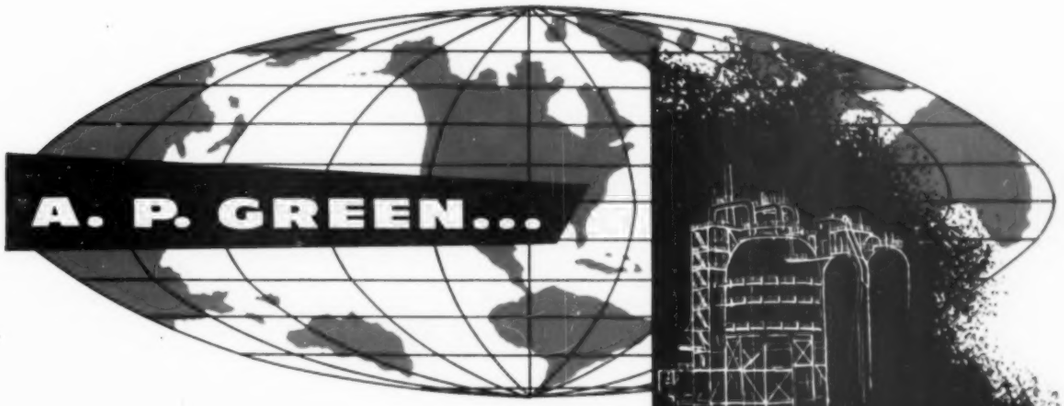


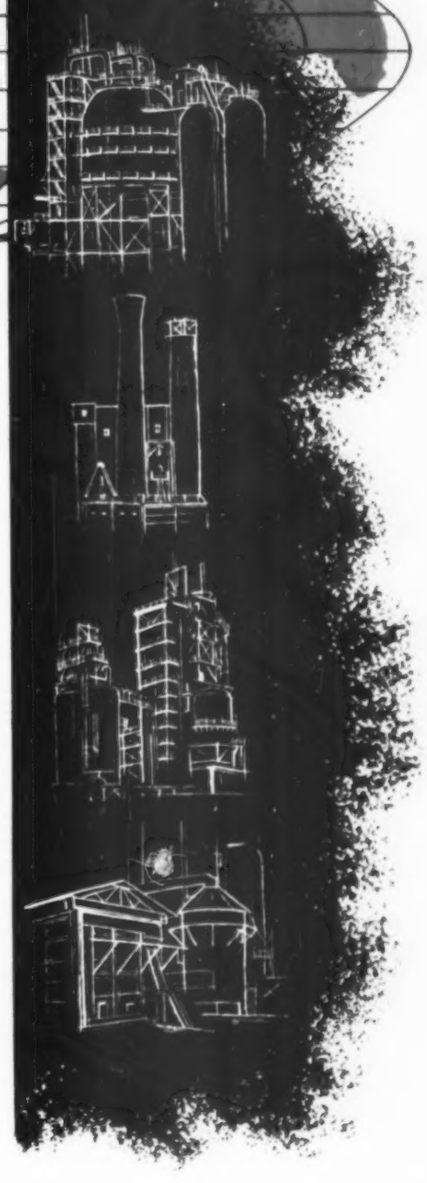

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# LONDON LETTER

*BP Tanker Co.'s 32,000-ton oil tanker "British Soldier" in Loch Long, Scotland, on her way to company's Finnart ocean terminal: From Finnart, the oil delivered by the tankers is pumped along a 57-mile pipeline to the Grangemouth oil refinery near Edinburgh.*

### South Wales Pipeline

Construction has begun on what will be Britain's longest crude pipeline when it is completed by the end of 1959. The pipeline will run for nearly 60 miles across South Wales, linking BP's new deep-water tanker terminal now being built at Milford Haven to the BP Llandarcy refinery, and will have an annual capacity of five million tons. Site work, begun at the Llandarcy end, initially is being concentrated on the more difficult sections where the pipeline will cross roads, rivers, and railways. Next spring, work will start on the main run of the line which will be laid at the rate of two miles a week. About 100 men are being employed on the job this winter, and this will rise to around 450 next spring. There will, however, be a high degree of mechanization. The 18-in. pipeline will be of welded steel pipe buried a minimum of 2 ft 6 in. below ground level.

### 'Jet Age' Pipeline

Plans are being made to supply aviation fuel to London airport by pipeline. Shell-Mex and BP Ltd. will seek approval of Parliament to a private bill to permit construction of a line to carry the fuel from storage at Walton-on-Thames. The pipeline is made necessary by the advent of the jet age in civil aviation, coupled with the increasing expansion of air traffic. It will provide the most speedy and reliable method of supplying the airport.

### Swamp Exploration Trailer

Designed to transport heavy oil-field equipment over swamp land in the Niger delta, a new type of trailer was recently shipped to the Shell-BP Petroleum Development Co. of Nigeria Ltd. Built by R. A. Dyson & Co. Ltd., of Liverpool, in conjunction with Shell engineers, the 28-ton trailer is fitted with especially wide rubber and steel tracks, instead of normal pneumatic tires. These tracks give a ground pressure of between 8 and 9 psi fully laden. Gross weight of the trailer is 44 tons. The front and rear tracks are respectively 8 ft 9 in. and 12 ft 9 in. in length, and have been supplied by James A. Cuthbertson Ltd., of Bigger, Scotland. The flat platform body measures 25 ft by 9 ft 3 in. A steel roller at the rear facilitates loading with skid-mounted oil-field drilling equipment, which is hauled onto the trailer by means of a winch rope from the tractor.

### Drilling-Mast Bogie

A steerable bogie, first of its kind to be made in UK, recently was shipped to Compania Shell de Venezuela for oil-field use. Of 20 tons capacity, the bogie will be used in conjunction with an oil-field truck to transport a 133-ft-high drilling mast weighing about 38 tons as a complete unit. Developed by R. A. Dyson & Co. Ltd., of Liverpool, in association with Shell engineers, it will help reduce rigging time to a minimum. With the mast loaded on truck and bogie, the outfit is approximately 145 ft long.

### 1959 Plastics Exhibition

The International Plastics Exhibition will be held at Olympia, London, June 17-27, 1959. More than 270 firms from 11 different countries already have applied for space which will have to be ballotted for. Organizers are the journal *British Plastics*. In line with world growth of plastics, the exhibition is expected to exceed all previous events in number of exhibitors, diversity of countries represented, and attendance.

### Visits Kent Refinery

Lord Mills, the Minister of Power, recently paid a visit to BP's Kent refinery on the Isle of Grain. The Kent oil refinery is one of the largest and most modern in Europe, capable of refining 7.2 million tons of crude annually. Built at a cost of more than £70 million, it processes a full range of oil products from high-octane aviation gasoline to fuel oil. At its seven jetties, tankers can discharge their cargoes of orude or load refined products for Europe and other parts of the world. Products can also leave by road and rail.

### Tanker News

The single-screw 18,000 dwt steam tanker STS "Anadara," built by Hawthorn Leslie (Shipbuilders) Ltd., at Hebburn shipyard for Shell tanker fleet, was launched October 29, 1958.

The 35,000 dwt "British Aviator," a new tanker for the BP Tanker Co., was launched from Swan Hunter and Wigham Richardson's yard at Wallsend-on-Tyne, December 23, 1958.

Kockums Mekaniska Verkstad, Malmo, Sweden, on November 12, launched the 40,700 dwt turbine-driven oil tanker "Iowa" for The Texas Co., New York.

Vickers-Armstrongs (Shipbuilders) Ltd. are to build a new large dry dock on the Tyne, 850 ft long, 145 ft wide, with 35-ft depth of water over the blocks. It will accommodate tankers up to 85,000 dwt. A new deep-water quay 640 ft long is being built to the east of the present works. When this is complete, the total river frontage will be 2,000 ft adequately served by cranes.

Early in November the first crude oil was discharged at BP's new tanker jetty at Finnart, on Loch Long, Scotland. Two tankers—the BP Tanker Co.'s 32,000 dwt "British Faith" and a chartered vessel, "London Majesty," 18,000 dwt—unloaded between them some 47,000 tons of crude for dispatch by pipeline across Scotland to BP's Grangemouth refinery on the Firth of Forth. This event marks the coming into operation of BP's £2 million project, started in May 1957, to provide discharging facilities at Finnart for the largest tankers foreseeable.

### Personals

**J. MOFFAT** has been appointed deputy general manager (refineries) of BP's refineries and technical department, with responsibility for manufacturing operations and planning of overall refinery programs throughout the BP group. **Dr. T. TAIT** becomes manager, refineries division, a post which will cover the work of the present areas divisions (to be renamed UK refinery group, continntal refinery group, etc.), and of production control branch. **J. W. HYDE** has been appointed assistant coordinator (research) and **W. J. NEWBY** assistant coordinator (development) under P. Docksey, coordinator of research and development. **M. A. L. BANKS** is general manager of refineries and technical department, also a director of BP Trading Ltd. **S. W. ADEY** is deputy general manager, with Mr. Moffat as deputy general manager (refineries). **R. C. THOMSON** is chief engineer.

The foregoing organizational changes and appointments are the result of increase in scope of work of BP's refineries and technical department.

Monsieur **JEAN MAILLOCHEAU**, on his retirement as managing director of Soc. Anon. des Huiles Castrol (Castrol's French affiliate) flew to London for presentation of a gold watch by Leonard Broadway, deputy chairman and managing director of C. C. Wakefield & Co. Ltd., October 16. M. Maillocheau, with distinguished war service, joined Castrol in Paris in 1923, and has been managing director there for 28 years. He is succeeded by Monsieur **ALBERT BAUDART**, formerly assistant manager.

**E. J. WADDINGTON**, a director of Vickers Ltd. and of Vickers-Armstrongs Ltd. and, until his recent resignation due to ill health, of many subsidiary companies, died recently. Mr. Waddington, 64, joined Vickers Ltd. in 1920. He was appointed to the board in January 1955, and named director of finance in 1957. **A. H. HIRD** has relinquished his seat on the board of Vickers-Armstrongs (Engineers) Ltd. due to pressure of other commitments.

**K. E. SHUREY** becomes deputy group publicity manager of C. C. Wakefield & Co. Ltd. **JOHN C. EDMUNDS** becomes assistant publicity manager (Castrol and Agricastrol). **LAURENCE SULTAN** becomes group public-relations officer of the Wakefield organization.

**M. H. SAYERS** has been appointed apprentice training manager of F. Perkins Ltd., the Peterborough diesel-engine company. Retired after 30 years' service in the Royal Navy, Mr. Sayers for several years was responsible for administration and training of air artificer apprentices at H.M.S. Condor, Arbroath.

**D. B. MIRK**, chairman and managing director of the Le Grand group of companies, is on a business visit to Canada and the USA, and will spend some time with Le Grand Ltd., a subsidiary company at Calgary which supplies oil-field equipment to the Alberta oil fields.

*L. W. Farrow*

*R. W. Fox*

**REGINALD WILLIAM FOX** celebrated his 40th anniversary with Mobil Oil Co. on October 1. Mr. Fox has been the company's coordinator for lube and allied products in the technical services department. At a luncheon, he was presented with a gold watch by Mr. Blake Middleton, a Mobil director.

**LESLIE W. FARROW**, since 1943 chairman of C. C. Wakefield & Co. Ltd., parent of the Castrol group, celebrated his 70th birthday, October 7. In addition to the Castrol group, Mr. Farrow is associated with many other companies as a director or consultant. He occupied government executive posts during World Wars I and II.

# Unique Teamwork

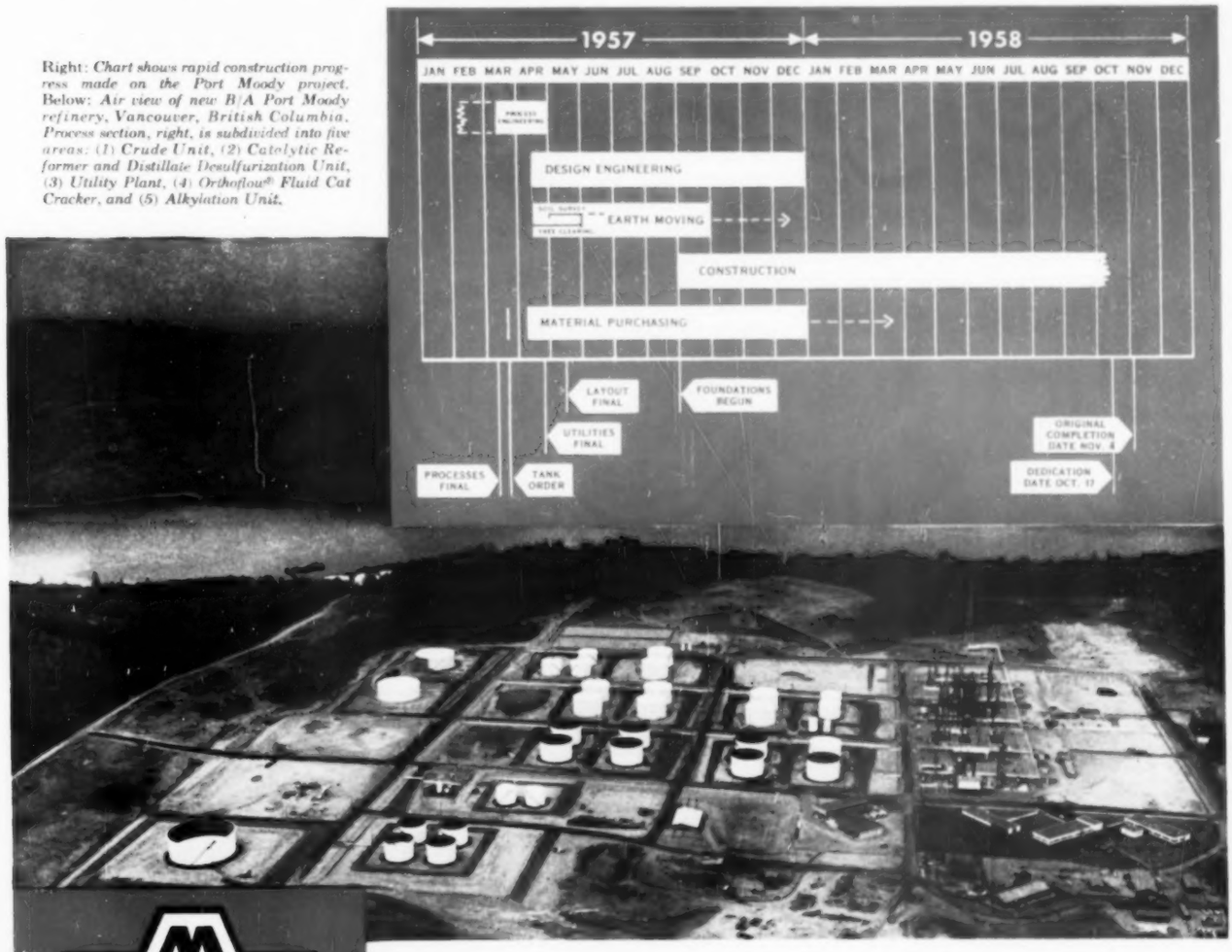
## Speeds Completion of B/A's Port Moody Refinery

Foreseeing unusually rapid changes in the West Coast marketing situation, the British American Oil Company in the Spring of 1957 decided a new "grass roots" refinery was required in the Vancouver area by the Winter of 1958. Eighteen months or so is a short time to plan and execute a refinery project. Canadian Kellogg's accomplishment of this unusual speed record is a testimony to the B/A organization and its ability to delegate decision-making. Working with a special team of B/A engineers who could make decisions "on the site", Kellogg completed the project ahead of schedule.

One of the first things Canadian Kellogg required were horses—the only transportation the engineers could use to negotiate the muddy conditions on the site. But a strategically placed drainage and pumping system soon dried the ground and proved so effective that after its installation not one day's labor was lost through wet conditions. Other practical solutions to construction problems, plus the most advanced chemical engineering, have made the investment per barrel capacity of the B/A Port Moody refinery relatively very low.

Right from the start Canadian Kellogg's experience and B/A's cooperation pushed the job ahead of schedule. Of course, B/A and Canadian Kellogg have worked together before. The Port Moody contract was awarded to Canadian Kellogg mainly on past performance . . . this move in itself saved the time and money normally spent preparing and analyzing detail bids. Mutual respect between client and contractor was one of the outstanding factors that contributed to the speedy completion of the project.

Right: *Chart shows rapid construction progress made on the Port Moody project.* Below: *Air view of new B/A Port Moody refinery, Vancouver, British Columbia. Process section, right, is subdivided into five areas: (1) Crude Unit, (2) Catalytic Reformer and Distillate Desulfurization Unit, (3) Utility Plant, (4) Orthoflow® Fluid Cat Cracker, and (5) Alkylation Unit.*





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# *Alkimia*

In the eighth century A.D., when monasteries in Britain offered only a classical education to a selected few, the advancement of science rested, in large measure, with the Arab peoples. One of the greatest of Arab alchemists, Abu Musa Jabir ibn Hayyan —known to the West as Geber — first experimented with a man-made "catalyst", namely sulphuric acid to produce ether from alcohol.

Today, man-made catalysts, carefully controlled at every stage of production, are essential in many branches of industry. And the I.C.I. range of catalysts is well known and widely used in heavy chemical, petroleum chemical, and petroleum refining processes.

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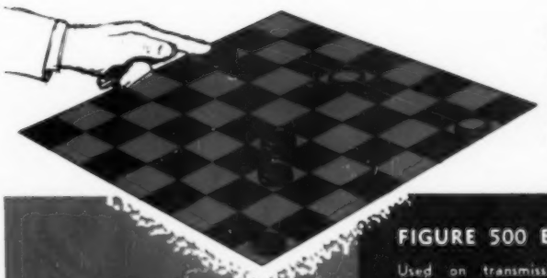

FIGURE 500

### FIGURE 500 BLANK CAP

Used on transmission systems the world over for scraper traps, strainers, blowdowns and other installations requiring a "blanking" end. All sizes to 38", in ASA Series 150 through 1500, with or without hinges. Features O-Ring seal, 2-piece design.

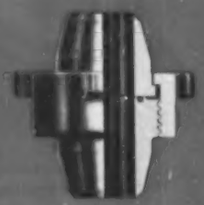

FIGURE 505

### FIGURE 303 MIS-ALIGNING UNION

Provides for 7½° mis-alignment in any direction without losing pressure seal. Mating parts move on arcs of a common circle to give smoothest mis-aligning movement. Ideal for use where temperature extremes cause expansion and contraction. Sizes to 8", for working pressures to 5000 psi.

FIGURE 303

### FIGURE 505 WELDING UNION

Fills all requirements of the transmission industry for a "quick" connection. O-Ring provides positive seal against gas, liquids or vapors, pressure or vacuum. Withstands temperatures to 400° F. All sizes to 24", in ASA Series 600.

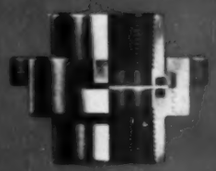

FIGURE 110

### FIGURE 110 INSULATED UNION

Prevents electrolytic corrosion by breaking the flow of current. Non-conductor gasket has tremendous compressive strength — is resistant to all common acids, oil and gas. Double O-Rings assure positive seal. All sizes to 16", for working pressures to 10,000 psi.

FIGURE 400

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Slim LaGrone Co.—Odessa, Texas
Bob Hawk Eqpt. Co.—Hobbs, N. M.
Broiles & Cope—Wichita Falls, Texas
A. S. (Andy) Herron—Lake Charles, La.
C. B. Blair—Shreveport, La.
Louis Ray—Farmington, N. M.

Rocky Mtn. Spec. Co.—Casper, Wyo.
Howard Crider—Oklahoma City, Okla.
L. P. Kinnear—Great Bend, Kansas
Lee Snodgrass Co.—South Gate, Cal.
Neil Ginther—Wooster, Ohio
R. S. Stokvis & Sons, Inc.—New York
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### FIGURE 400 CHOKE UNION

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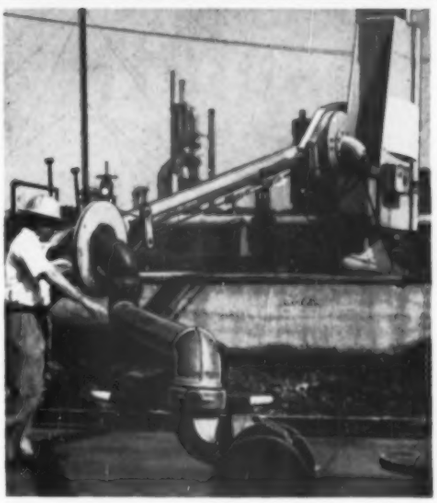
Gear reduction enables one man to adjust the flange position anywhere in a 105° vertical range. Outboard arm is manually swung into position at any point in a 130° horizontal arc. The eight inch model rotates 360° to permit servicing barges on both sides of a narrow dock. Once hookup is made, the arm can be left unattended while free wheeling allows the unit to ride free during loading and unloading. When not in use, the arm is raised up and out of dockside traffic.

6" x 25' and 8" x 28' sizes available. Handle petroleum products, both black and bright, and mild caustics in any temperature ranging between —60° F. to +225° F. Service all river and lake barges and lake tankers including those in 25,000 barrel class.



The Chiksan Barge Loading Arm is designed to reach approximately 20 feet from dock riser to barge flange. Total length of Arm is 25 feet.

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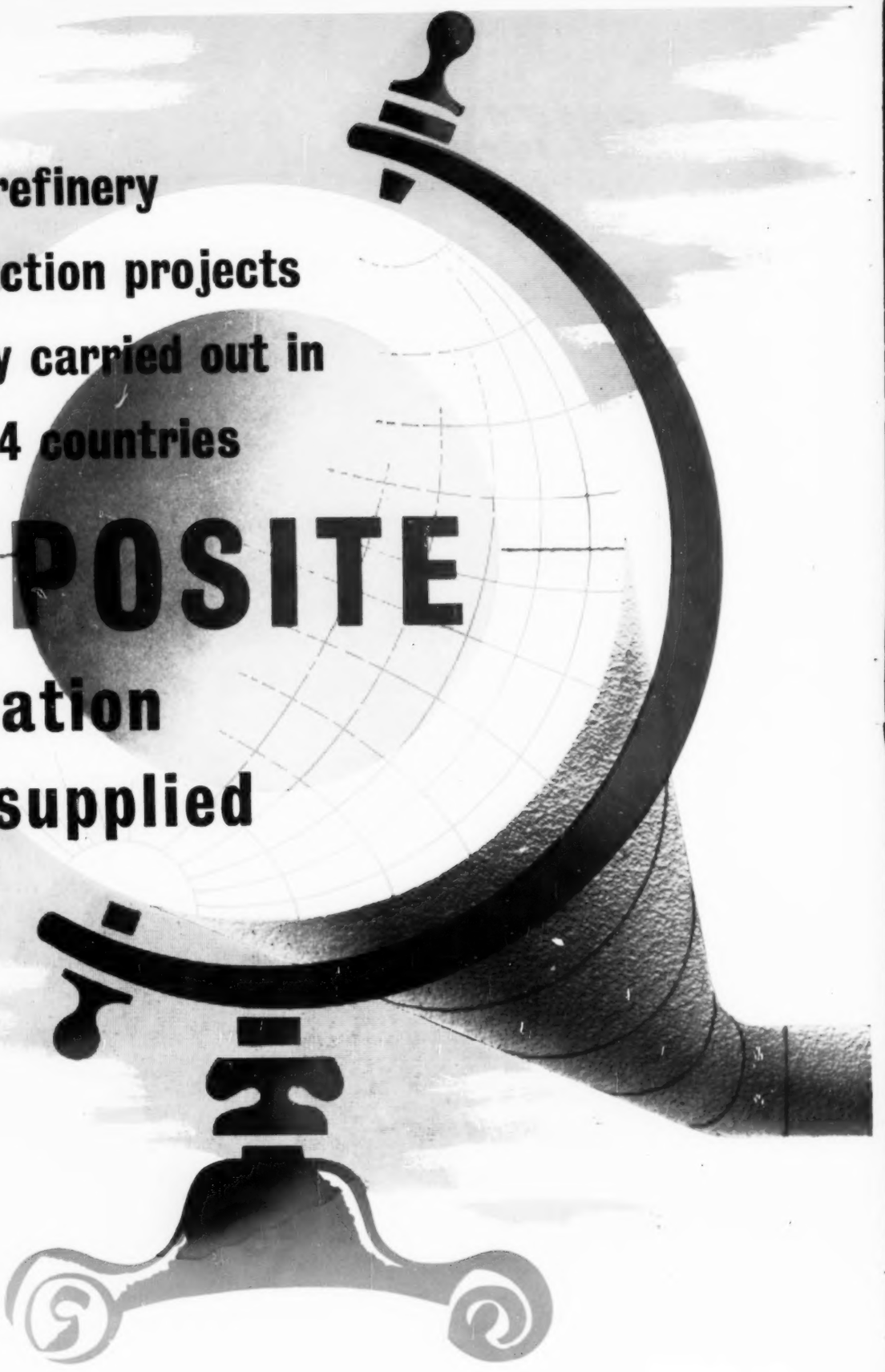

**BAHRAIN** *at Awali*
for Bahrain Petroleum Co. Ltd. Main Contractor: Foster Wheeler Ltd.

**BURMA** *at Syriam*
for The Burma Oil Co. (1964) Ltd. Main Contractor: Foster Wheeler Ltd. (London)

**CANADA** *at Clarkson, Ontario*
for British American Oil Co. Ltd. Main Contractor: The Lummus Co.

**COLOMBIA** *at Cartagena*
for International Petroleum Co. Ltd. Main Contractor: Bechtel Corporation (Insulation Contractor: Harold Aber & Co.)

**ECUADOR** *at La Libertad*
for the Anglo-Ecuadorian Oil Co. Ltd. Main Contractor: Preson (G. B.) Ltd.

**ENGLAND** *at Kent Oil Refinery*
for The British Petroleum Co. Ltd.

**FRANCE** *at Raffinerie de Normandie*
for Compagnie Francais de Raffinage. Main Contractors: Kellogg International Corporation and Foster Wheeler Ltd. (France). (Insulation Contractor: Soc. Technisol)

**IRAQ** *at Daura, near Baghdad*
for Iraq Government Oil Refinery Administration. Main Contractor: Foster Wheeler Ltd. (London).

**ITALY** *at Genoa*
for Raffineria Dottore E. Garrone. Main Contractor: C. T. I. P.

**KUWAIT** *at Akmadi*
for the Kuwait Oil Co. Ltd. Main Contractor: Bechtel-Wimpey and E. B. Badger & Sons Ltd.

**THE NETHERLANDS** *at Pernis*
for N. V. de Bataafsche Petroleum Maatschappij.

**NETHERLANDS ANTILLES** *at C.P.I.M. Refinery, Curacao*
for Royal Dutch-Shell Group.

**SCOTLAND** *at Grangemouth*
for British Hydrocarbon Chemical Co. Ltd. Main Contractor: E. B. Badger & Sons Ltd.

**VENEZUELA** *at Maracaibo*
for The Richmond Exploration Co. Main Contractor: The Lummus Co.

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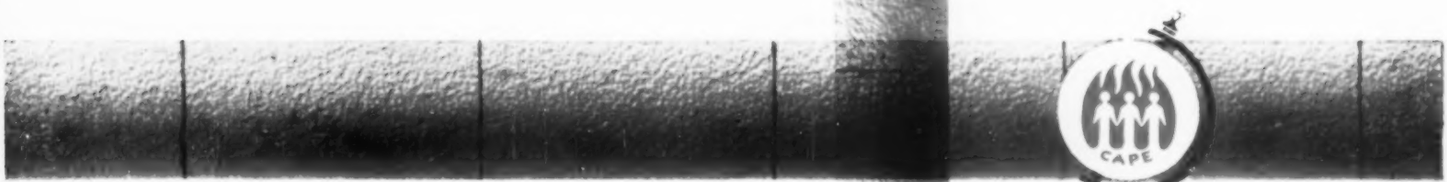

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# LATIN AMERICAN OIL NEWS

## Sign Argentine Contracts

Standard Oil Co. (New Jersey) and Shell Oil Co. have signed contracts with YPF, the Argentine government oil company, for the development of Argentina's oil. Following are abstracts of the two contracts:

*Standard Oil Co. (New Jersey)* has confirmed that its wholly owned affiliates, Esso Sociedad Anonima Petrolera Argentina (SAPA), an integrated Argentine company engaged primarily in refining and distribution operations in Argentina, and Esso Argentina Inc., a USA corporation, recently organized to carry out producing and exploration activities through a branch located in Argentina, have signed a development contract with Yaciementos Petroliferos Fiscales Argentinos (YPF), the Argentine government oil company. The contract will go into effect upon ratification by the Argentine government.

The principal objective of the contract is the rapid development of oil and gas production on a specific area on which development activities as well as exploration activities are entrusted by YPF to Esso Argentina. The area comprises approximately 480,000 hectares (about 1,185,000 acres) located in the province of Neuquen, some 800 miles southwest of Buenos Aires. Oil production in Neuquen province at present amounts to about 12,000 b/d.

Both YPF, which is the major producer, and Esso SAPA produce oil and gas in the province of Neuquen. Under the contract, YPF will retain title to the oil and compensate Esso Argentina with a fee. The fee will be paid in Argentine pesos, and will be related to the price quoted in US dollars at three reference points. This fee will vary with the international price for equivalent crude based on the average posted price of Venezuela, the US Gulf Coast, and the Persian Gulf at loading port. The initial fee will be the peso equivalent of $11.50 per cubic meter (6.3 bbl) up to 2,000 cubic meters a day (about 12,600 b/d); $11.25 for the amount between 2,000 and 4,000 cubic meters per day (about 25,200 b/d); $11.00 for all amounts above 4,000 cubic meters per day. Pesos not required for local operations under the contract will be remittable currently in dollars.

Esso Argentina has undertaken expenditure commitments in the producing and exploration part of the contract as follows: an initial period of three years during which Esso Argentina will spend a minimum of $10 million; a second period of three years during which, if Esso Argentina elects to continue the operation, it will spend a minimum of $13 million; a third period of four years at the beginning of which, if Esso Argentina elects to continue its operation, it must select and surrender half of the area and spend according to a formula based on reserves and corresponding producibility, provided a market exists for the oil.

The formula with regard to the third period involves an expenditure of at least $24 million if reserves to support 4,000 cubic meters or more of daily production have been proved by the end of the second period. Commitment would be reduced proportionately in case lesser volumes were discovered. In the final period of 20 years, no minimum commitments are specified, but Esso Argentina agrees to reduce the area to 25% of the original area and to complete the development of the remaining portion.

Esso Argentina also has agreed to finance and build a pipeline not to cost in excess of $23 million for the account of YPF from the Neuquen field, some 625 km (about 390 miles) to the coast at Bahia Blanca. The line will be owned and operated by YPF, who will repay its cost in dollars in 30 equal annual installments with interest at 5% per annum on the unpaid balance.

Esso SAPA will continue normally its activity in the refining, transportation, and marketing end of the business. Esso SAPA also will continue to operate its oil and gas properties held for many years in the province of Neuquen, but has agreed to change their status from perpetuity to the life of the contract. Esso SAPA's producing properties located at Salta in northern Argentina, and also held in perpetuity, were voluntarily ceded to YPF without charge under the contract.

The parties agree to consider from time to time in the future the possibility of extending Esso Argentina's exploration and producing activity to other areas in Argentina on mutually acceptable terms.

In Buenos Aires and New York, company spokesmen welcomed this opportunity to cooperate with Argentina in her objective to obtain self-sufficiency in oil by making available their financial aid and technical experience.

* * *

*Shell Contract:* As a result of negotiations conducted in an atmosphere of cordiality and mutual understanding, an agreemnt has been concluded between YPF, the Argentine State oil entity, and associates of the Royal Dutch-Shell group of companies.

This agreement provides for exploration, development, and production activities to be carried out by one of the Shell companies over an area put at its disposal for the purpose by YPF, situated in the region of Rio Negro near the city of Bahia Blanca, approximately 500 miles south west of Buenos Aires, adjoining the coast. Unlike most of the other contracts recently concluded which cover proved or semi-proved areas, this is an area which still has to be fully explored and covers approximately 11,500 square miles. This area will be reduced progressively over a mutually satisfactory period to 10% of the original acreage.

Arrangements are being made to begin active operations under the new agreement within a very short time, and the agreement envisages expenditure of a minimum sum of £10 million over a 10-year period during which exploration and development operations will be conducted leading to the full development of any oil discoveries that may be made.

The expenses incurred in carrying out the operations will be repaid to the operating company as and when oil is produced, and when quantities of oil equal in value to these expenses, as arranged between YPF and the two Shell refining and marketing associates in the country, can be handed over to the latter to meet their marketing requirements. Once the expenses have been met by this method, the fruits of them will be shared by the balance of the oil being divided equally between YPF and the Shell refining and marketing companies.

## Phillips In British Honduras

Phillips Petroleum Co. has acquired three blocks of oil and gas leases and prospecting licenses totaling approximately two million acres in southern British Honduras, marking the company's first entry into Central America. The rights were secured from Bandini Petroleum Co., Belize Petroleum Co. Ltd., and West Caribbean Oil Co. Ltd. Phillips is beginning geological and seismic surveys of the acreage, which is both on land and in shallow, protected waters offshore. The company planned to start drilling an exploratory well by the end of 1958 at a location to be determined by the initial geological and geophysical work.

Gordon W. Wilson, who has been a production superintendent for Phillips in Venezuela, has been named manager of the company's operations in British Honduras with headquarters in Belize.

## Ships 10 Rigs To Argentina

Ten complete new Loffland Bros. portable drilling rigs were recently shipped to Argentina by Mid-Continent Supply Co., in one of the biggest movements of oil-field equipment ever undertaken by an oil-field supply company. They will be used by Loffland Bros. to drill for Pan-American International Oil Co. in the Comodoro Rivadavia area on three proved and semi-proved structures assigned to Pan-American under its oil development contract with YPF. The contract calls for drilling 50 wells during the first year.

The rigs were manufactured in Tulsa by Unit Rig & Equipment Co., and equipped with 126-ft. Lee C. Moore telescoping masts. They will be used to drill to 6,000 ft, although they are capable of drilling to 9,500 ft.

Loffland will use Cummins diesel engines throughout its operation, so that all parts will be interchangeable. This includes specially modified Cummins diesel-powered trucks for transportation of the rigs in Argentina, as well as drawworks, pump, and generator engines. A torque tube will be used between the drawworks and Emsco D-700 pump, thus saving the cost of extra engines.

The trailer-mounted drawworks are Mid-Continent U-36-A powered with two 500-hp Cummins VT-12 diesel engines. Pumps are Emsco D-700 and D-500.

Other major items of equipment include the Mid-Continent S-17½-L rotary table, Mid-Continent BH-438-A block-hook combination, and Mid-Continent rig drive. Also included in each shipment were portable mud pits, drill pipe, rotary hose, wire line, diesel-powered trucks, house trailers, pickup trucks, and hundreds of other items necessary for an efficient drilling operation.

## Venezuela Breaks 50-50 Concept

A dramatic first move in Venezuela's demands for increased payments by oil companies arrived Friday night, December 19, when the outgoing junta, in one of its last moves, hiked the income tax. This was not a move by Bettancourt, the new president-elect. He has not taken office yet, but is expected to during January. His spokesman said it was a move by the military junta to take credit for increasing oil-company payments, something Bettancourt has said he intends to do. At any rate, it was a crippling blow to oil.

The income-tax rate in Venezuela was, under the 1948 law (which was altered, but not fundamentally, in 1955) a maximum 26% on income of 28 million bolivares (about $9.8 million) or over. The new maximum is 45% on the same income. It raises the government's share of net profits to about 60%.

This was a severe blow to oil companies, especially those which had invested over a half billion dollars in new concessions during the past two years. Essence of the companies' position was expressed in a statement by H. W. Haight, president of Creole Petroleum Corp., largest producer in Venezuela. He said: The "new income-tax law has drastically altered the climate for foreign investment in this country.

"By this action, Venezuela becomes first country in the world to break so-called 50-50 principle of equal shares in fruits of industry completely disregarding acquired rights and ignoring the moral if not legal obligation to negotiate this rupture with interested parties.

"Some other oil-producing countries have recently concluded certain oil agreements which depart from 50-50 but in no case have existing concessions or fiscal agreements been modified. Action was taken in spite of promises made to oil industry here by President of Government Junta in meeting at Miraflores Palace on February 5, 1958, that no changes affecting oil industry would be made by provisional Government and that existing laws would be adhered to.

"The President-elect during the recent political campaign said that any change in petroleum policy in Venezuela would be negotiated with the Venezuelan petroleum industry as a commercial matter.

"This action, therefore, comes as a great surprise and is viewed with alarm because it raises grave doubts as to future actions.

"During years 1956 and 1957 the oil industry acting in good faith and in belief that 50-50 would not be unilaterally broken paid approximately $686,000,000 to Federal Treasury for new concessions.

"It seems probable that some of these companies will now feel that they have been defrauded."

"This increase in cost comes at times when there is great surplus producing capacity. We are now placed at great competitive disadvantage. We will undoubtedly lose markets and this will reduce our sales income. Inevitably this will lead to reduction in investment. It is highly uncertain whether Government will obtain with additional income tax a larger share of the oil income than it would receive under the 50-50 agreement. Only time will tell. Among other things it will depend on the amount available for re-investment and the climate which exists for investment in this country."

## Erratum

World Petroleum, November 1958, p. 16, carries an item on construction of a 15,000 b/d refinery in Cuba. This refinery by International Industries Inc. (N. J. corporation) is to be built in Honduras in the Gulf of Fonseca area—not in Cuba.

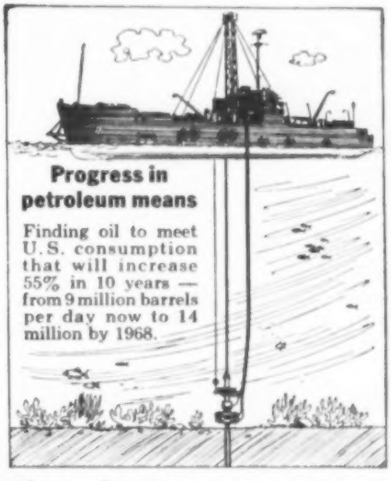
*Navy landing ship converted by Standard for off-shore oil search. A 55-foot drilling mast is poised over circular 10-foot-wide opening from deck through bottom.*

## "Live" TV show 40 fathoms down guides our search for future oil reserves

**With new oil becoming harder to find,** our search widens. Now we're exploring the ocean floor — and new techniques are the rule. In one such venture we lowered a TV camera 250 feet below the waves to help guide the drilling of test holes from shipboard.

This is typical of the novel techniques used in our quest that last year took us to 21 states, Canada, Alaska and ten Latin American and Caribbean countries. In all, we drilled 120 exploratory wells. Although the cost ran to many millions, the successful ones helped us locate more new oil than we withdrew from the ground.

Actually, this benefits you as well as Standard. It means an adequate reserve of our most valuable national resource, to be drawn on in days ahead to provide the thousands of products from petroleum so essential for your daily needs.



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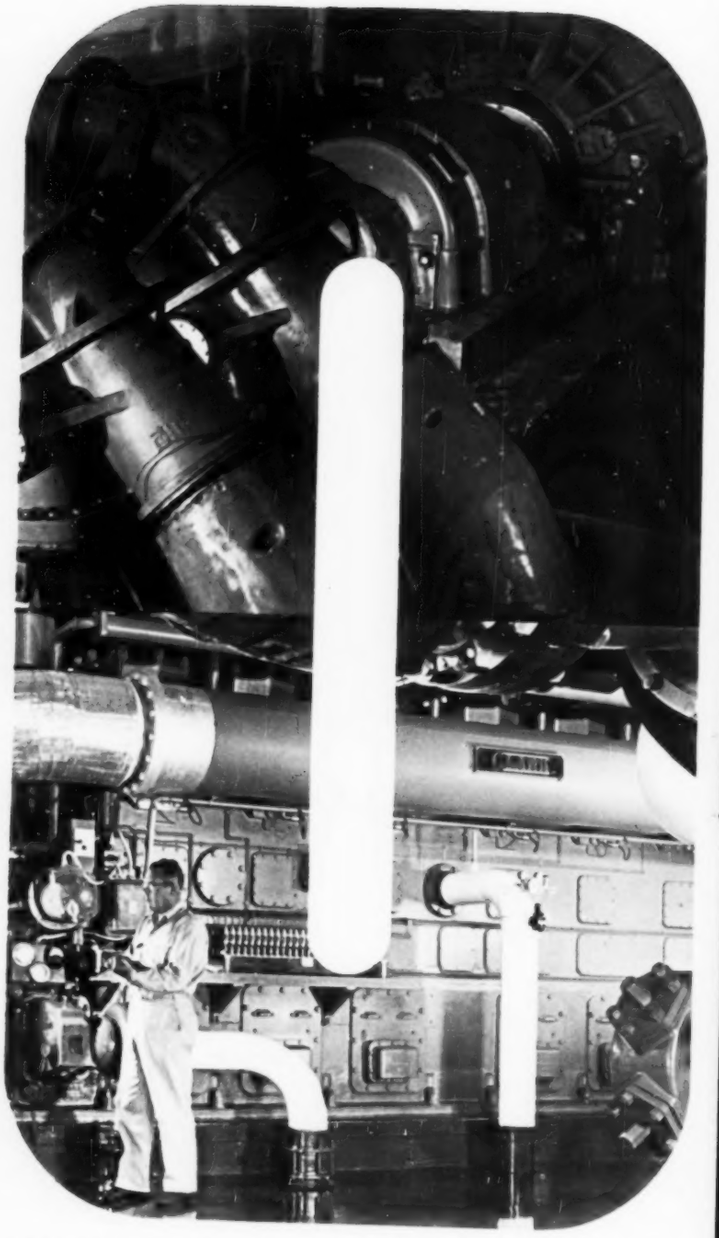

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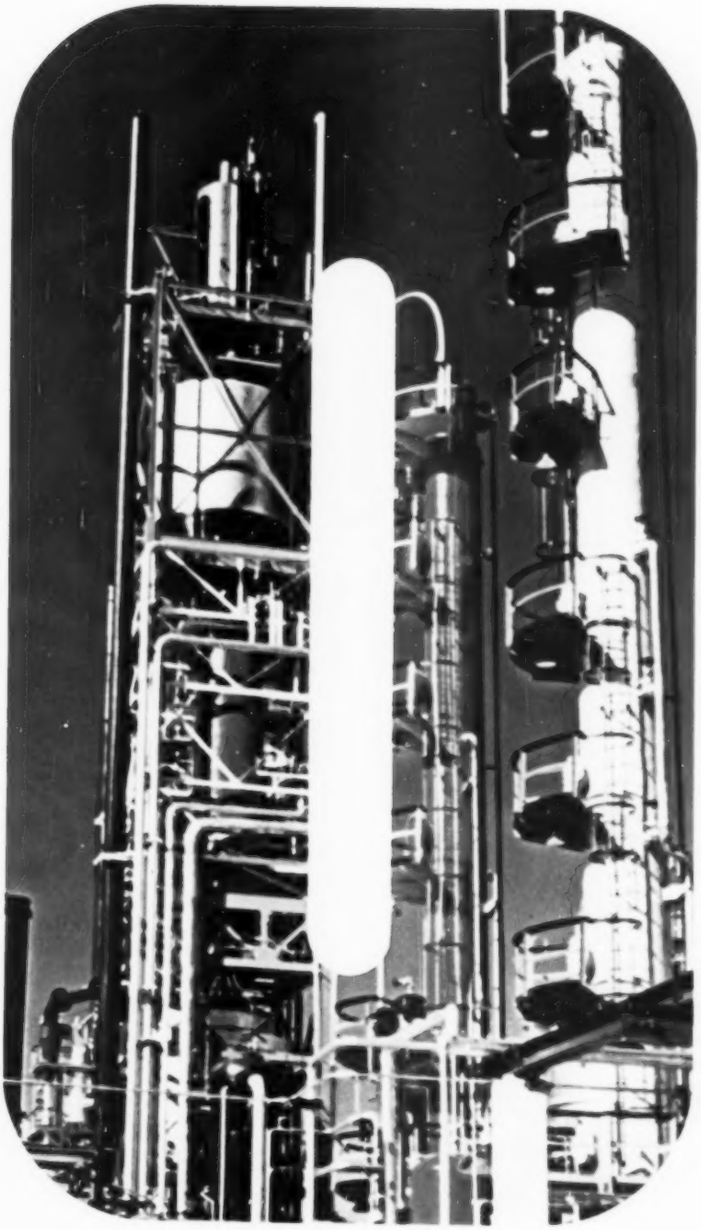

Dresser Industries salutes the Petroleum Industry and its next century of progress and pays tribute to the industry's many fine accomplishments during its first one hundred years of service.

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# OIL COMPANY STAFF CHANGES

**C. A. McDOWELL** of Shreveport, La., a veteran of 50 years in the oil and gas industry—more than 40 of which were spent with Union Producing Co., production subsidiary of United Gas Corp. and predecessor companies—retired on November 1.

**WALTER SHANNON** has been appointed director of pipeline engineering for Gulf Oil Corp., with headquarters in Pittsburgh. Mr. Shannon formerly was vice president and manager of operations for Gulf Refining Co., at Houston. He will counsel Gulf, its subsidiaries and affiliates, regarding new developments in pipeline design, facilities, construction, operation and maintenance.

**E. W. ALLEN,** executive vice president of Wilshire Oil Co. of California, Los Angeles, Calif., will take charge of marketing, in addition to his present duties. **MARK E. HOUSER** has been appointed director of manufacturing and will manage refinery and pipeline departments, and coordinate economic research.

**R. D. PATCH,** former head of the petroleum products division at the Baton Rouge (La.) refinery of Esso Standard Oil Co., joined the refining coordination department of Standard Oil Co. (N.J.), Esso's parent company, on January 1. He will serve as regional coordinator for refining for the Eastern Hemisphere, succeeding Brian Mead, retired.

Mr. Patch was petroleum-products manager from 1954 to 1956, when he left for an overseas tour with Esso AG, Jersey Standard affiliate in Germany. He returns from Germany to take his new position.

**L. R. WOOLSEY** has been appointed general manager of marketing of British American Oil. He succeeds A. E. OSBOROUGH who has retired.

**L. J. CAMPBELL** has been appointed vice president, refining and manufacturing, of Canadian Husky Oil Ltd., Calgary, Alta. A graduate of the University of Montana, he began with Husky Oil Co. at Cody, Wyo., in 1941. Later he transferred to Canada to the company's Lloydminster refinery.

**HOWARD G. JOHNSON** has been appointed vice president and general manager by the board of Hunter Drilling Ltd., Calgary, to succeed the late Jack Hunter. Mr. Johnson formerly was manager of Can-American Drilling Ltd., and prior to that was division engineer for Hughes Tool Service Ltd. **REGINALD STEVENS** has been appointed drilling superintendent for Hunter Drilling to succeed the late Val Valint. Mr. Stevens has been employed by Hunter Drilling in various capacities for the past six years. Messrs. Hunter and Valint lost their lives in a recent air crash.

**H. L. RAY** has received appointment as general manager of BP Refinery Canada Ltd., newly formed to operate the Montreal refinery of BP Canada Ltd., the marketing associate of the British Petroleum Co.

**CLIFFORD R. WALKER,** a director of Pacific Petroleums Ltd., has been named president of Kroy Oils Ltd., Calgary. He had served as president and director of Merrill Petroleums Ltd., prior to its amalgamation with Pacific. Other new appointments announced to fill vacancies created by resignations include William H. Atkinson, former treasurer of Home Oil Co. Ltd., secretary-treasurer. Directors include John A. Scrymgeour, former executive vice president of Home Oil; William Knode, formerly general manager of Alberta Gas Trunk Line Co. Ltd., and H. Richard Whittall, a partner of Norman R. Whittall Ltd., investment brokers in Vancouver.

**FRANK P. CASTLEBERRY** has been named manager of The Atlantic Refining Co.'s Alberta-British Columbia crude-oil producing district at Calgary.

**JOHN M. TAYLOR** has been appointed manager of Canadian Pacific Oil and Gas Ltd., with headquarters in Calgary. Mr. Taylor joined CPR's department of natural resources in Calgary in April 1955.

**JOHN V. JAMES** has been appointed vice president-finance for Clark Bros. Co. Division of Dresser Industries, Olean, N. Y. For the past 15 months Mr. James has been assistant comptroller for Dresser Industries on a staff assignment with Clark Bros. Co. Since June of this year he has served as financial assistant to the executive vice president with Mr. Clark.

**C. HAINES FINNELL** has been appointed manager of retail marketing for Union Oil Co. of California, Los Angeles.

**LEE N. HAUGEN,** formerly vice president and general manager of Cit-Con Oil Corp., has been elected vice president, general manager, and board member of Cities Service Research and Development Co. He succeeds Walter W. Scheumann, who died on October 5.

## BENTON E. WARREN

Benton E. Warren, manager of Sun Oil Co.'s Latin America production division, died recently of a heart attack. He was 59. Mr. Warren was also vice president and general manager of several subsidiary companies operating in Latin America. They include Venezuelan Sun Oil Co., Colombian Sun Oil Co., and Guatemalan Sun Oil Co.

## C. GILBERT COLLINGWOOD

C. G. Collingwood of New Orleans, formerly manager of retail and jobber sales in Gulf Oil Corp.'s New York sales division, died in New Orleans after a fall. He was 60.

**Oil is our cup of tea.** Not literally, of course, but we do have considerable knowledge of the oil business in Canada. The Supervisor of our Oil and Gas Department keeps us fully up to date on all aspects of this important Canadian Industry. Over the years, Imperial Bank has made it a policy to keep a finger on the ever-changing pulse of the nation's business and industry. Contact with the Supervisor, Oil and Gas Department, Imperial Bank of Canada, 001 Mobil Oil Building, Calgary, Alberta, will keep you informed of business opportunities and developments.

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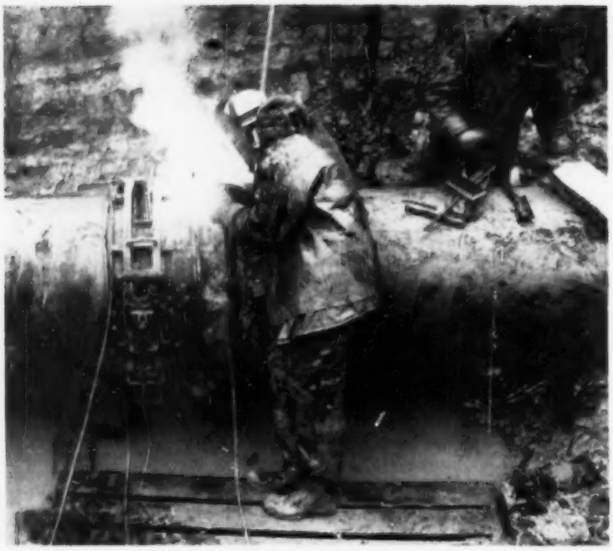

*The final weld of the 2,294-mile Trans-Canada Pipe Lines natural-gas line from Alberta to Montreal was made, October 10, at Kapuskasing in northern Ontario. The welder, wearing leather windbreaker and hip waders to protect him from the cold, the rain and mud, worked from a platform in the water-logged ditch under conditions typical of the final stages of construction.*

### Against Alberta-Montreal Line

Dr. John Davis, Canadian energy-source authority, has advised Gordon commission against Alberta-Montreal pipeline on grounds that basic economics are working against Canada's desire for oil self-sufficiency in Montreal area. Shutting off flow of imported oil could work to region's disadvantage because higher-priced oil in Montreal could lead to many alternative fuel sources.


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### Trans-Canada Complete

Trans-Canada Pipe Lines Ltd. announced that final testing of the company's natural-gas line from Alberta to Montreal had been completed, October 22, and approval from the Board of Transport Commissioners for Canada received.

The 2,294-mile big-inch pipeline, longest natural-gas line in the world, was completed well ahead of schedule when the final weld was made near Kapuskasing, October 10 at 6:46 p.m. Natural gas from Alberta, upon arrival in Toronto, was then to move through the line to Ottawa and Montreal.

Construction of the Texas-Canada line began in July 1956, near Burstallon the Alberta-Saskatchewan border. By the winter of 1957 Alberta natural gas was being used in homes and industries as far east as Port Arthur. The Toronto-Montreal section of the project also was completed late in 1957 and placed in service with an interim supply of gas.

During the 1958 construction season, 5,000 men built the final 852 miles of the line, working east from Port Arthur on the Northern Ontario Pipe Line Crown Corp. section of the line, and north from Toronto on the Trans-Canada section. Official ceremonies marking the completion of the $375 million project will be held later.

### Canadian Gas Prices

Trans-Canada Pipe Lines Ltd. has signed two gas purchase contracts at initial prices of 13¼¢ per mcf, escalating ¼¢ per year to maximum of 18¾¢ on 25-year terms. Price is 3¼¢ higher than original contract prices of 10¢ with same escalation terms. Contracts with Canadian Delhi Oil Ltd. and Canadian Chieftain Petroleums Ltd. cover gas from southeast Alberta fields.

### Saskatchewan Pipelines

Producers' Pipe Lines Ltd. is seeking permit for crude-oil pipeline paralleling existing line of Trans-Prairie between Weyburn field and Producers' terminal in Midale field. It also asks permit for gathering system at Weyburn. This is first major conflict of interests since Trans-Prairie received permit two years ago to build line. Field producing operators always considered Trans-Prairie tariff too high, and it was reduced 3½¢, or 20%, on October 1.

### USA 1958 Demand

SONJ chairman Eugene Holman predicts USA demand will not show traditional 4% to 5% per year increase in immediate future. He expects 1958 increase to be 1.5% over 1957. Texaco chairman Long predicts free world oil demand should approach 22 million b/d within five years, or one-third above current level.

*O. C. Clifford*

*E. V. McCollum*

### New SEG Officers

Incoming officers for the Society of Exploration Geophysicists are president E. V. McCollum, of E. V. McCollum & Co., Tulsa, Okla.; vice president William M. Erdahl, of Skelly Oil Co., Tulsa, Okla.; secretary-treasurer Robert Dyk, of Tidewater Oil Co. L. Y. Faust, Amerada Petroleum, Tulsa, was re-elected editor.

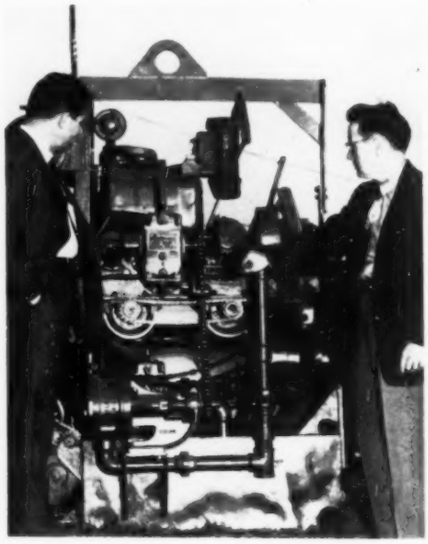
Retiring members of the SEG executive council are president Clifford; vice president Ben F. Rummerfield, Century Geophysical Co.; secretary-treasurer Howard E. Itten, Empire Geophysical Co.; and past president Roy F. Bennett, Sohio Petroleum Co.

*B. F. Rummerfield*

*W. M. Erdahl*

### British Petrochemicals

Inaugural meeting of the newly formed Paper & Textile Chemicals Group of the Society of Chemical Industry was held in October in Manchester. On petroleum as chemical aids, R. C. Tarring, manager of detergents department, said the first major production of synthetic detergents in Britain was planned and undertaken originally with the textile industry in mind as the major outlet. Although the household market is now the largest outlet, considerable tonnages are used in the textile industry for wetting, dispersing, and detergency.



*Aldo Formiconi (left), from Venezuela, South America, discusses pipeline construction equipment with John Manley, export sales manager for M. J. Cose Manufacturing Co. Inc., Tulsa, Okla. Mr. Formiconi heads his own company which is currently laying 10-in. pipe for gas lines in vicinity of Cardon and Amuay, Venezuela. The Formiconi firm also engages in other oil-field construction work including large volume-tank erection. The company has three offices in Venezuela and another office in Rome, Italy.*

*"A truly dramatic shift in product development has taken place in the field of petrochemicals. A short time ago, the industry's chemical business was a sideline. But today, with the development of products such as butyl rubber, polypropylene, fuel and lube-oil additives, alcohols, ethers, aromatics and many others, this stepchild business has become a full-fledged member of the family—and one to be reckoned with. In petrochemicals, the real leader is the one who finds new products, and new uses for new products."*

*—M. J. Rathbone, President, Standard Oil Company (New Jersey)*

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## The most practical method for producing alkylate: Butamer and HF Alkylation in combination as a single unit

Increasing use of alkylate for blending into motor fuels makes these two up-to-the-minute processes highly important to petroleum refiners. Butamer is a new process for producing isobutane . . . "HF" Alkylation is an efficient, economical process which combines isobutane with olefins to produce alkylate, much in demand today as a motor fuel component.

With the advent of high compression ratio engines, usually starting at 9.5:1, motor fuel, especially those deficient in isoparaffins, have been associated with an unusual engine noise called "rumble." Further study reveals this rumble can be eliminated through the use of a better balanced fuel, namely using a fuel composed of a greater volume percentage of isoparaffins. Alkylation produces a high octane isoparaffin that also has good sensitivity, ignition point and combustion characteristics.

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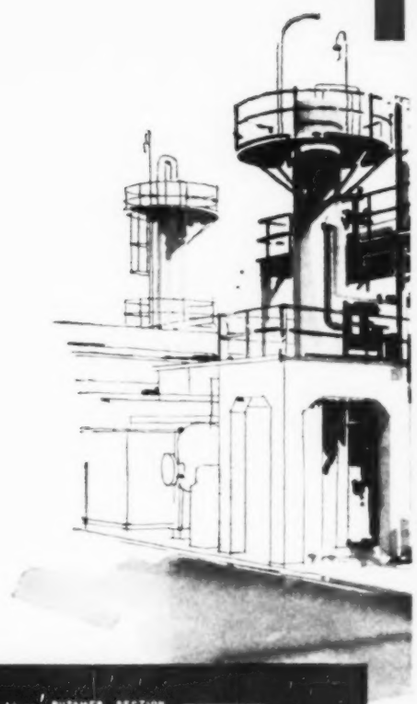

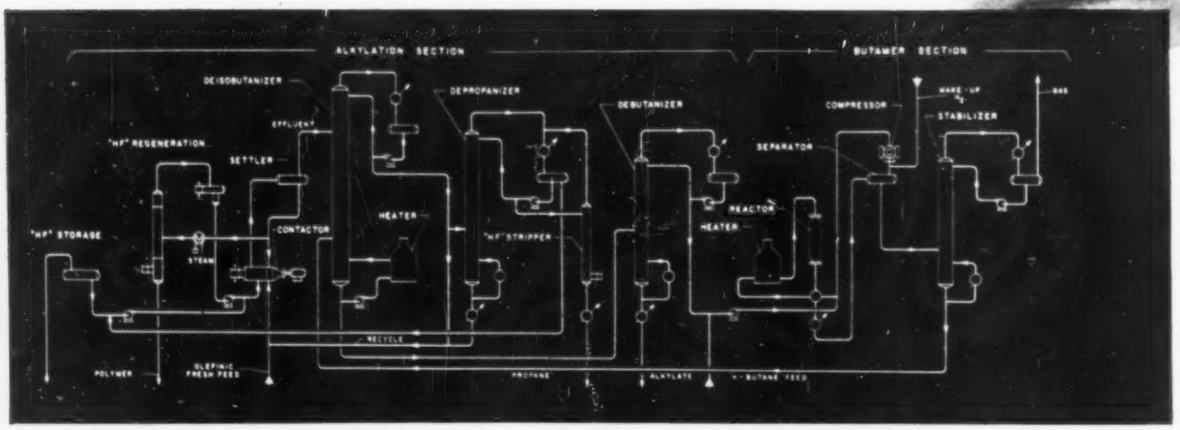


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Operating under hydrogen pressure, with low hydrogen-to-charge ratio, the high catalyst activity results in economical liquid hourly space velocities, thus requiring only a modest catalyst inventory. The mild operating conditions further assure minimum loss to by-products.

***HF Alkylation***—"HF" Alkylation is a catalytic process which combines olefins such as propylene, butylenes, and amylenes with isoparaffins (usually isobutane) to form a mixture of branched chain hydrocarbons of higher molecular weight known as alkylate for aviation and motor fuel.

These two processes are readily and economically integrated. Together, they form the ideal, most practical method for producing alkylate.

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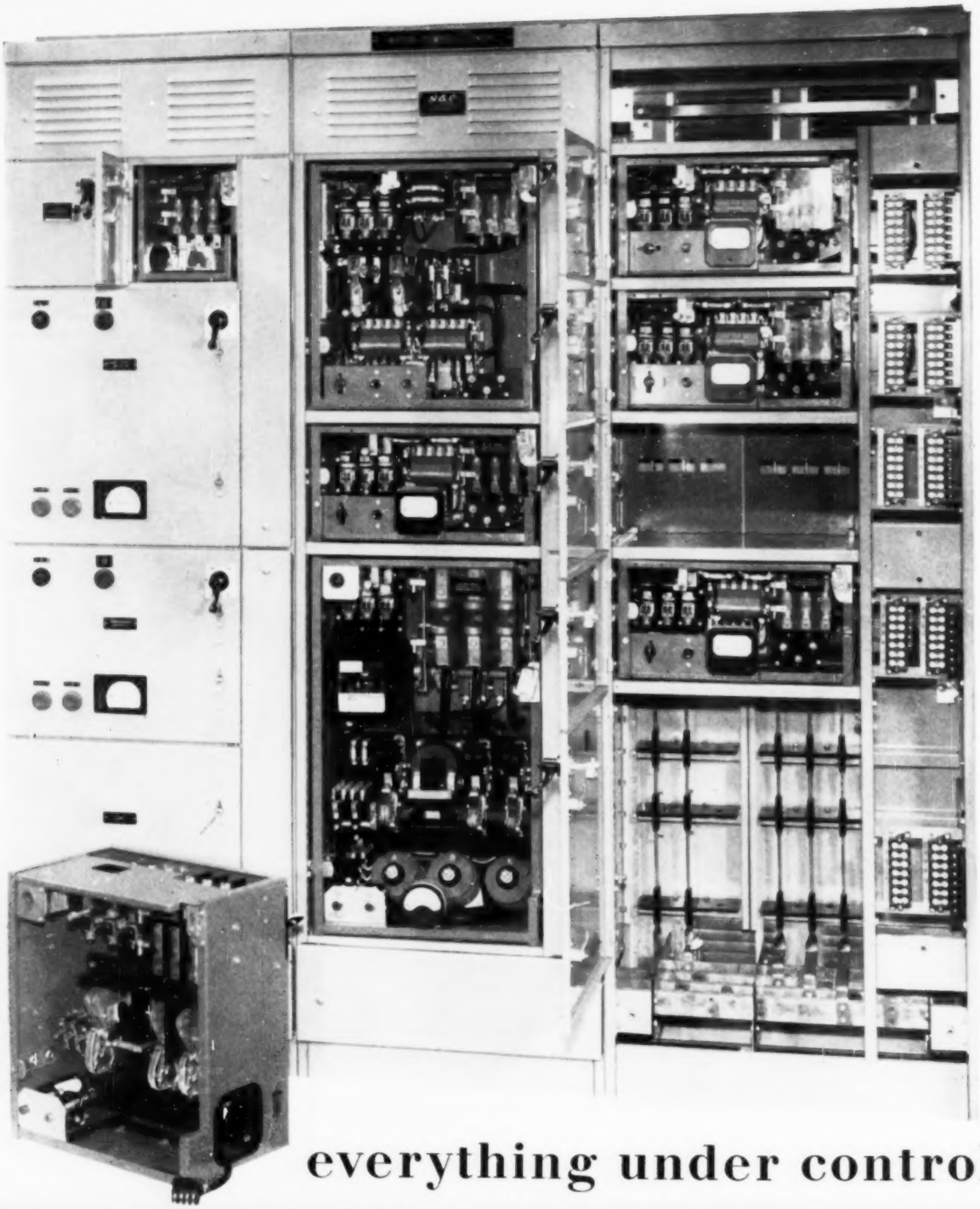

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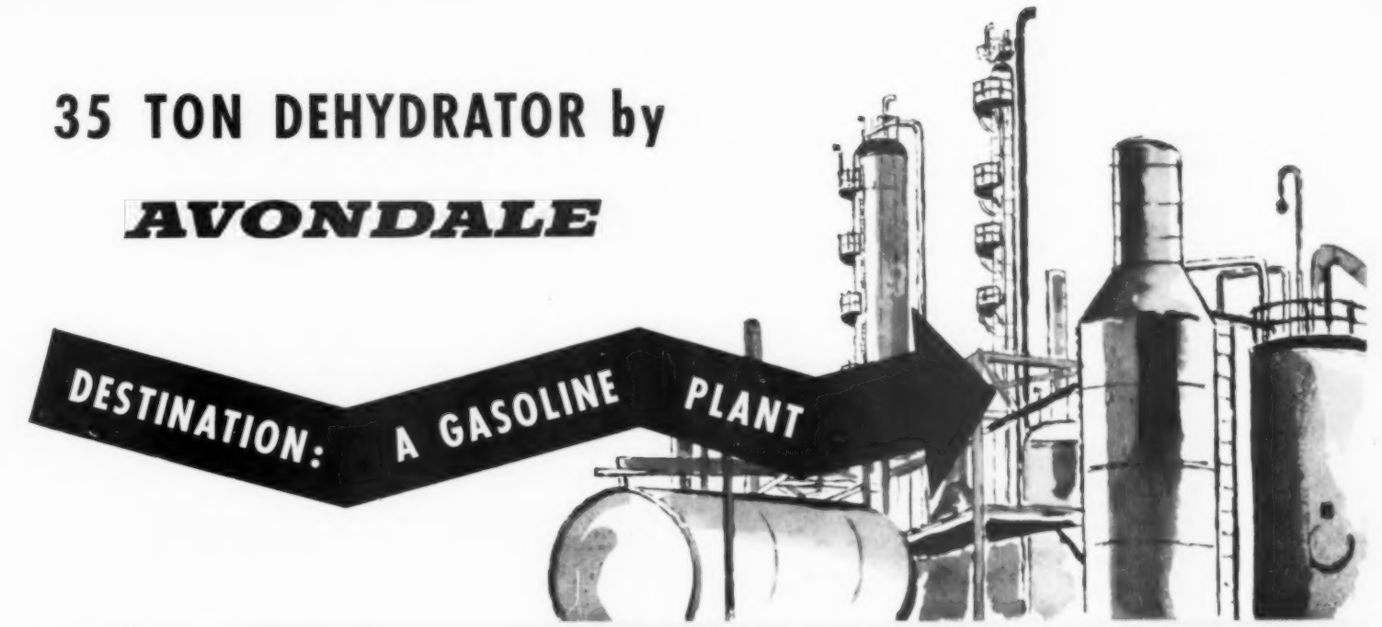
# 35 TON DEHYDRATOR by AVONDALE



The product you see above is a large dehydrator—35 tons of heavy steel plate—40 ft. long, 2⅜ in. thick and fabricated by Avondale. The same facilities that turn out ships for the Navy, now serve the interests of the industrial portion of the oil industry—large capacity machine facilities unmatched in the South. From design and engineering to delivery of the finished product, Avondale is equipped to handle the overall job . . . whether the contract calls for a pressure vessel or any one of hundreds of other industrial steel products.

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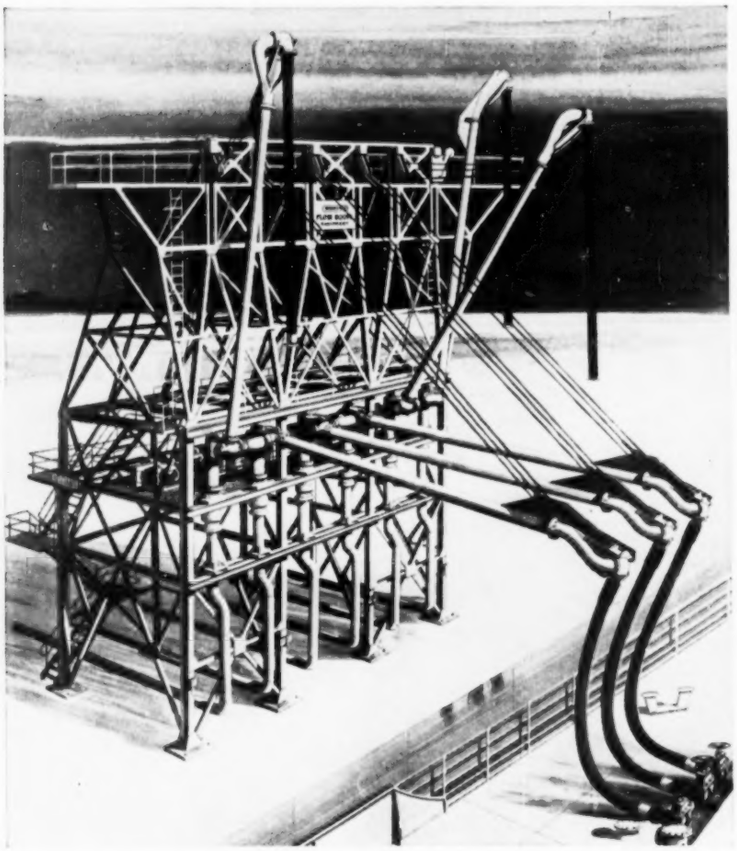
# WOODFIELD FLOW BOOM EQUIPMENT

## *loads and unloads Tankers from 2,000 to 100,000 tons capacity*

## *and allows for manifold rise and fall of 75ft.*



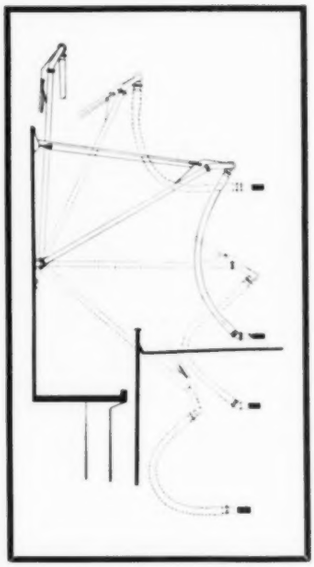


*Diagram showing luffing motion of Flow Boom. This system can be designed to accommodate tankers ranging from 2,000 to 100,000 tons, and to suit local berthing conditions anywhere in the world.*

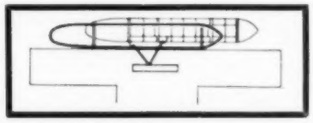


*Diagram illustrating manner in which free slewing of Flow Boom permits safe tanker drift.*

**Woodfield Flow Boom Equipment features these vital advantages:—**

- ★ **Slewing arcs in excess of 120 allow wide tolerances in tanker spotting and drift.**
- ★ **With this equipment tanker manifold heights may vary by 75 ft.: subject to sizes of tankers handled and local tide conditions.**
- ★ **Boomhead Swivel, exclusive Woodfield development ensures minimum restraint and maximum life of hoses.**
- ★ **Standard Boom lengths 30 ft. and 40 ft.**
- ★ **King Posts: Exclusive Woodfield feature, including Woodfield Joints.**
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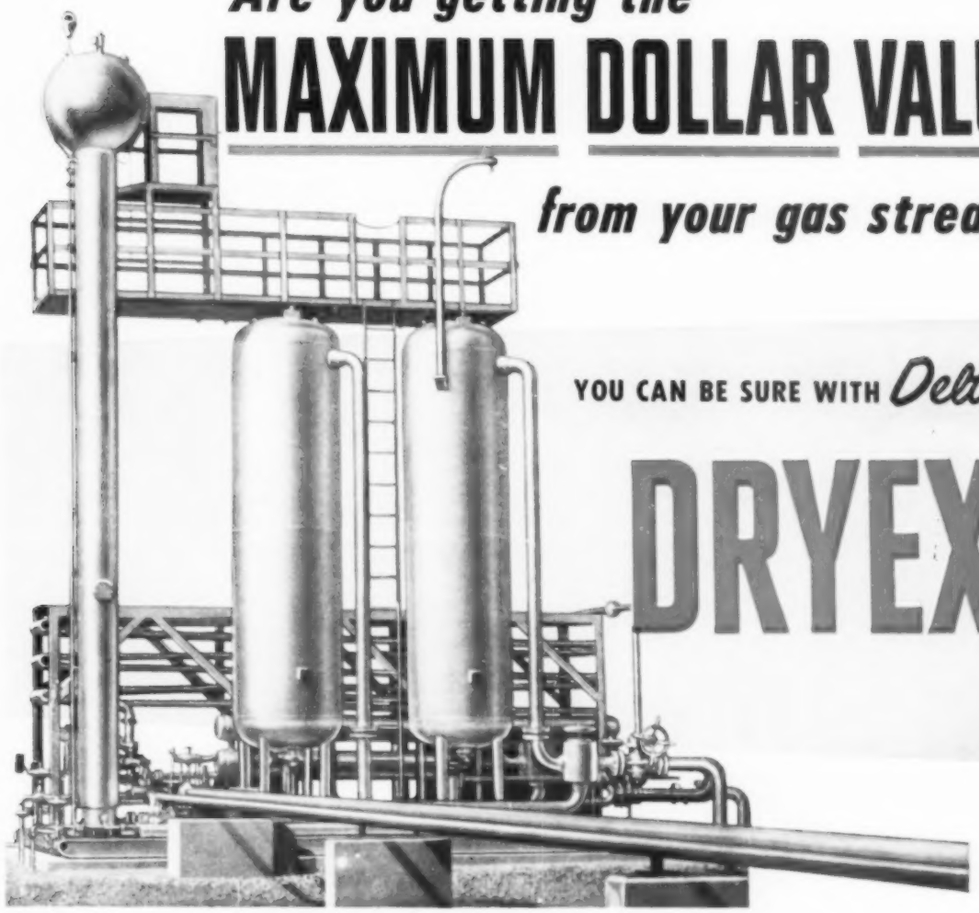

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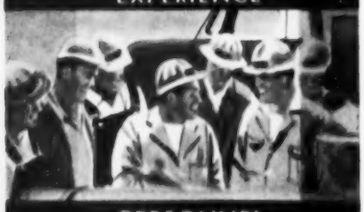

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**OIL WELL CEMENTING COMPANY**

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# The Public Interest In Oil Reserves

"The need today is for additional reserves and not a mere excess number of prorated wells," R. M. Williams, assistant general attorney of Phillips Petroleum Co., said last August in an address before the Section of Mineral and Natural Resources Law of the American Bar Assn.

It is not difficult to demonstrate the truth of Mr. Williams' statement. For some years past, the known reserves of crude oil in the United States have grown very slowly, or not at all. Such growth as has been attained has come through improvement in production techniques or through extensions of previously discovered fields, and not through the discovery of new oil. Texas, the nation's No. 1 producing state with nearly half the known reserves of the USA, has found less oil than it has produced since 1951. Between the end of that year and December 31, 1957, Texas reserves declined three-quarters of a billion barrels.

During this same period, the producibility of crude oil has mounted year by year. Recently, flush wells in Texas have been permitted to produce only half-time. Were markets adequate to take all oil which can now be produced at MER in Texas, the rate of decline in reserves would clearly be at a frightening rate.

A year ago the Independent Petroleum Assn. of America reported that the USA oil industry as a whole could readily produce 25% more oil than it was lifting at that time. A year earlier, the National Petroleum Council had reached a similar conclusion.

Ability of the industry to build producibility more rapidly than reserves has come through excess drilling of development wells as well as through improved techniques of recovery such as fracturing, flooding, and the conservation or restoration of reservoir energy. In 1947, the USA domestic industry began the year with 20.87 billion barrels of known crude reserves, and during the succeeding year the nation consumed 2.10 billion barrels of crude oil. On December 31, 1957, known reserves of crude were estimated at 30.30 billion barrels, and in 1958 the nation consumed three billion barrels of crude. The industry thus has been consuming roughly 10% of its reserves each year in the past decade. Through improvements in producibility, the industry has created the ability to lift perhaps 12.5% of known reserves each year.

The 25% of producible oil which is not being lifted and sold today is creating market pressures of considerable magnitude. Having made substantial investments in drilling and completing new wells, the producer is naturally anxious to recover his capital. In the case of the independent producer, bank loans have been obtained in most cases, and there is a real necessity to sell oil in order to pay carrying charges and to amortize the loans.

One very real and grave danger confronting oil producers both large and small is the rising cost of crude. Drilling and completion costs have advanced in line with the inflationary spiral in the national economy, but the selling price of oil has not risen comparably because of the competition of lower-cost foreign oil. Government restraint on oil imports has tended to restrict low-cost competition, but such emergency measures create a stopgap which is most unsatisfactory in a free economy. The only satisfactory answer is to reduce domestic producing costs.

At the recent annual meeting of the American Petroleum Institute, L. F. McCollum, president of Continental Oil Co., emphasized this situation in his address titled "Cost Reduction—Homework for the Domestic Producer." Based on his own company's experience, Mr. McCollum said that 45% of the cost of crude arises from development, 35% from finding the oil, and 20% from lifting.

There seems to be not much immediate chance to cut costs significantly in oil finding. If anything, these costs are likely to rise because of the increased difficulty in finding new oil in the United States. Lifting costs can possibly be lowered somewhat through improvement in techniques, but the biggest opportunity lies in the field of development.

In multiple-pay zones, development costs are being reduced materially by dual, triple, and quadruple completions. Recently, one company in Texas completed one well in three zones without running casing below water sands. Previously, casing had been omitted from dually completed wells to create substantial savings in completion costs.

The most fruitful area in which development costs can be reduced is in the restriction of the number of wells drilled. Gas fields in the United States often are developed on the basis of one well per square mile. A similar spacing is employed in the development of prolific oil fields in the Middle East. In most areas outside the USA, spacing is much wider than in domestic fields because the wells are sunk on the basis of efficient drainage or crude requirements rather than on competitive factors. Elsewhere in this issue a report on current developments in Canada reveals that 80- and 160-acre patterns are being adopted there in areas where drilling is required to prove or validate leases but where the drilling of more wells would create a financial burden because of severe proration.

Wide spacing proves reserves at minimum cost and preserves fill-in drill sites for a national emergency. In the public interest, USA laws should be overhauled to promote discovery of new reserves and to reduce development costs through the limitation of unnecessary drilling.

# World crude production tops 18 million barrels daily

*Crude output rose 2.4% in 1958, while demand was 6% higher. Outlook for 1959 is for an increase of 6.9% in world consumption.*

World production of crude oil increased 2.4% in 1958 to 18,098,900 b/d, according to estimates gathered by WORLD PETROLEUM on the basis of operations during the first 10 to 11 months. The increase of 424,000 b/d was the smallest in volume as well as percentage in recent years. The increase compares with 1.1 million b/d in 1957, 1.2 million in 1956, and 1.6 million in 1955.

Output of natural-gas liquids was virtually unchanged during the year at one million b/d, bringing new supply of liquid petroleum to about 19,100,000 b/d.

The slower rate of rise in petroleum output was made necessary by the second disappointing year in sale of products in the United States and by a tendency toward leveling off in other parts of the world. Correction of the inventory situation also was responsible for the failure of output to maintain its usual upward pace. In the United States alone, stocks of petroleum had risen at the rate of 167,000 b/d in 1957, with the result that storage was becoming congested and an economic burden. In 1958 the oil industry in the United States withdrew 127,000 b/d from storage to meet current demand. Crude output was reduced about 7%, natural-gas liquids 1%, and total new supply, including imports, 4.3%. Stocks at the end of the year were only 15 million barrels greater than at the end of 1956.

Consumption of petroleum on a worldwide basis increased about 6% in 1958 to 18,930,000 b/d, compared with about 17,864,000 b/d in 1957. The figures include natural-gas liquids as well as crude oil, and are estimates based on trade during the first nine months of the year in most instances. Table I gives details by major areas.

In the Western Hemisphere the rise in oil consumption in 1958 was only 2.6% because of the unsatisfactory demand in the USA caused by warm weather and slow recovery from the 1957 recession. Domestic demand in the USA rose 2%, while elsewhere in the hemisphere increase in sales was about 5%.

Market expansion in the Eastern Hemisphere was much more rapid than in the West, as has been the case most of the time since World War II. Sales were 11.4% higher than in 1957. Western Europe and the communist nations in Europe and Asia enjoyed the greatest increase in sales. There was a small loss in demand in Africa, but Asian business was up about 6.8%. Contrasted with this was the nearly 15% increase in the oil trade in western Europe and the estimated rise of 14% in the USSR and its satellites.

Looking forward to the new year, most students of the oil industry expect a continuation of recent records in the Eastern Hemisphere and a sharp improvement in American markets. The percent of increase in the USA may be more than double that obtained in 1958. Most forecasts suggest a rise of 4.2% to 4.5%. Elsewhere in the Americas, the growth in demand is expected to be something over 6%.

There is no reason at this time to suppose that Eastern Hemisphere oil demand will not increase by at least 10%. The USSR is budgeting a 14% growth per year, and western Europe again should top its old record by 10% or more.

Assuming that the 1959 estimates are realized, demand for petroleum will reach about 20,232,000 b/d. Deducting expected production of natural-gas liquids totaling 1,100,000 b/d, it seems likely that demand for crude petroleum will support an output of about 19 million b/d, an increase of 6.9% over 1958.

Based on announced plans of the Soviet Union, it is assumed that production of the USSR and satellites again will increase about 15%, or about 362,000 b/d. In view of the known reserves and rate of drilling in Russia, there is no reason to doubt that a production rate for the bloc can be maintained at 2,780,000 b/d in 1959. In fact, a much larger production could be attained if adequate transportation facilities were available. The estimate of 2,780,000 b/d is made on the premise that the USSR will not seek to disrupt world markets by attempting to increase its present share. Only growth in domestic demand at recent rates is contemplated in the WORLD PETROLEUM estimates; and this, of course, is at a phenomenal pace, particularly in heavy industries.

The competitive danger of Russian oil cannot be overlooked. At some point, when transportation and producing facilities are appreciably greater than domestic requirements, it may be expected that barter deals will be made or sales for currencies which the USSR can use to advantage. An example of this latter type of transaction is seen in the recent sale of substantial quantities of benzene in the USA. In 1957, Russia shipped 24.3 million gallons of benzene to the USA, and this will be increased more than 100% in the next two years as a result of the sale of 54 million gallons to Dow Chemical Co. Russia is said to ask only 24 cents per gallon for benzene, which is a deep cut under the current USA market. Russia apparently is increasing its steel production much more rapidly than its output of plastics, and hence has a large surplus of benzene for export.

The Russian invasion of the benzene market is reminiscent of its participation in European oil markets in the '20s. At the moment, the Russian policy is to reduce the use of coal as a source of domestic energy and to throw a greater share to oil and gas so the USSR is able to consume rapidly increasing volumes.

If normal market conditions continue, it is likely that imports of crude and products into the USA will not increase materially in 1959. Government policy, dictated largely

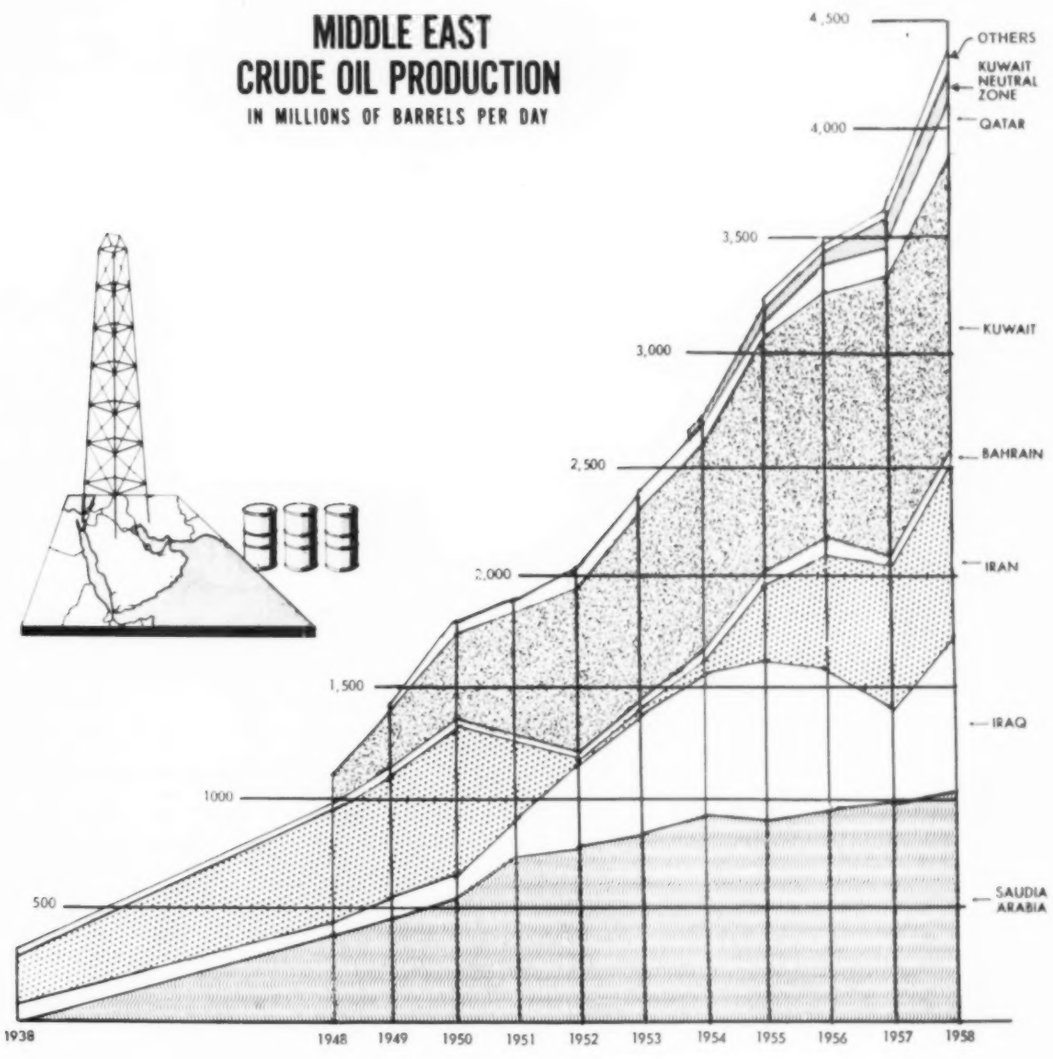


**TABLE I**

**WORLD CONSUMPTION OF PETROLEUM***

**(Thousands of Barrels Daily)**

| | 1957 | Est. 1958 | Est. 1959 |
|---|---|---|---|
| USA | 8,817 | 8,993 | 9,362 |
| Other North America | 780 | 805 | 845 |
| Latin America | 1,450 | 1,530 | 1,635 |
| Western Hemisphere | 11,040 | 11,328 | 11,842 |
| Europe (Ex. USSR) | 2,680 | 3,080 | 3,360 |
| Africa | 457 | 434 | 455 |
| Asia | 1,565 | 1,670 | 1,795 |
| USSR and satellites | 2,122 | 2,418 | 2,780 |
| Eastern Hemisphere | 6,824 | 7,602 | 8,390 |
| World | 17,864 | 18,930 | 20,232 |

*Includes crude and natural-gas liquids.

**TABLE III**

**PERCENTAGE DISTRIBUTION OF WORLD CRUDE PRODUCTION**

| Principal Countries | 1958 | 1957 | 1956 |
|---|---|---|---|
| United States | 37.0 | 40.4 | 43.2 |
| Venezuela | 14.4 | 15.8 | 14.7 |
| USSR | 12.6 | 13.2 | 9.5 |
| Kuwait | 7.6 | 6.5 | 6.5 |
| Saudi Arabia | 5.6 | 5.7 | 6.0 |
| Iran | 4.7 | 4.0 | 3.3 |
| Iraq | 4.0 | 2.3 | 3.9 |
| Canada | 2.5 | 2.9 | 2.8 |
| Indonesia | 1.8 | 1.8 | 1.5 |
| Mexico | 1.4 | 1.4 | 1.5 |
| Romania | 1.3 | 1.2 | 1.3 |
| Borneo | 0.7 | 0.7 | 0.7 |
| **Principal Areas** | | | |
| North America | 40.9 | 44.6 | 47.5 |
| South America | 17.0 | 18.1 | 17.0 |
| Western Hemisphere | 57.9 | 62.7 | 64.5 |
| Europe (inc. USSR) | 13.8 | 14.5 | 12.5 |
| Middle East | 23.8 | 20.0 | 20.5 |
| Asia and Australasia | 2.9 | 2.8 | 2.5 |
| Eastern Hemisphere | 42.1 | 37.3 | 35.5 |

**TABLE II**

**WORLD CRUDE-OIL PRODUCTION**

**(Thousands of Barrels Daily)**

| | 1958 | | | | | |
|---|---|---|---|---|---|---|
| | First Quarter | Second Quarter | Third Quarter | Fourth Quarter | Year 1958 | Year 1957 |
| United States | 6,644.0 | 6,356.0 | 6,867.0 | 6,950.0 | 6,704.0 | 7,175.0 |
| Canada | 492.7 | 407.1 | 450.8 | 460.0 | 452.0 | 498.2 |
| Mexico | 262.2 | 272.7 | 257.0 | 270.0 | 265.4 | 261.5 |
| Total N. Amer. | 7,398.9 | 7,035.8 | 7,574.8 | 7,680.0 | 7,421.4 | 7,934.7 |
| Argentina | 94.0 | 94.6 | 94.0 | 91.0 | 93.4 | 93.6 |
| Bolivia | 9.4 | 9.4 | 9.4 | 9.5 | 9.4 | 9.8 |
| Brazil | 43.5 | 43.9 | 55.9 | 59.0 | 50.4 | 27.7 |
| Chile | 14.4 | 14.1 | 15.1 | 15.1 | 14.7 | 11.8 |
| Colombia | 126.6 | 122.0 | 129.0 | 124.0 | 127.6 | 121.6 |
| Cuba | 1.2 | .9 | .9 | .8 | 1.0 | 1.0 |
| Ecuador | 9.3 | 9.3 | 8.6 | 8.5 | 8.9 | 8.7 |
| Peru | 55.0 | 53.0 | 53.0 | 53.0 | 53.5 | 52.7 |
| Trinidad | 97.9 | 100.7 | 103.0 | 104.0 | 101.4 | 93.2 |
| Venezuela | 2,517.8 | 2,510.6 | 2,603.6 | 2,800.0 | 2,608.7 | 2,779.3 |
| Total S. Amer. & Caribbean | 2,969.1 | 2,958.5 | 3,072.9 | 3,264.9 | 3,067.8 | 3,199.4 |
| TOTAL WESTERN HEMISPHERE | 10,368.0 | 9,994.3 | 10,647.7 | 10,944.9 | 10,488.1 | 11,134.1 |
| Austria | 57.5 | 52.5 | 52.1 | 51.1 | 53.3 | 59.2 |
| France | 26.9 | 27.8 | 28.0 | 24.0 | 26.7 | 28.1 |
| Germany (West) | 79.0 | 85.1 | 87.1 | 88.0 | 84.8 | 76.7 |
| Italy & Sicily | 32.0 | 28.0 | 28.0 | 28.0 | 29.0 | 20.6 |
| Netherlands | 30.7 | 29.3 | 29.1 | 29.0 | 29.5 | 29.6 |
| United Kingdom | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 |
| Total West Europe | 227.8 | 224.4 | 226.0 | 221.8 | 225.0 | 215.9 |
| Algeria | 4.0 | 10.0 | 10.5 | 11.0 | 8.9 | 3.6 |
| Gabon | 6.0 | 8.5 | 10.0 | 10.0 | 8.6 | 1.6 |
| Morocco | 1.6 | 1.6 | 1.5 | 1.2 | 1.5 | 1.6 |
| Nigeria | 3.1 | 6.0 | 6.0 | 6.0 | 5.2 | — |
| Total N. & W. Africa | 14.7 | 26.1 | 28.0 | 28.2 | 24.2 | 6.8 |
| Albania | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 |
| Czechoslovakia | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 |
| Hungary | 16.4 | 16.4 | 16.4 | 16.4 | 16.4 | 14.1 |
| Poland | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Romania | 228.4 | 228.4 | 228.4 | 228.4 | 228.4 | 228.3 |
| Yugoslavia | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| USSR | 2,177.8 | 2,255.8 | 2,290.0 | 2,360.0 | 2,271.4 | 1,956.8 |
| Total USSR & Sat. | 2,446.3 | 2,524.3 | 2,558.5 | 2,628.5 | 2,539.9 | 2,222.9 |
| Bahrain | 35.9 | 40.1 | 41.5 | 41.5 | 39.8 | 32.0 |
| Egypt | 34.0 | 55.4 | 63.0 | 61.5 | 54.5 | 42.1 |
| Iran | 817.0 | 799.8 | 359.0 | 825.0 | 825.2 | 714.4 |
| Iraq | 634.4 | 698.7 | 688.0 | 824.0 | 736.3 | 445.4 |
| Israel | 1.6 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| Kuwait | 1,341.8 | 1,371.2 | 1,375.0 | 1,485.0 | 1,393.2 | 1,139.9 |
| Neutral Zone | 90.0 | 90.0 | 75.0 | 90.0 | 86.2 | 62.7 |
| Qatar | 169.4 | 170.2 | 166.0 | 169.3 | 169.8 | 139.8 |
| Saudi Arabia | 1,030.4 | 953.0 | 1,039.0 | 1,030.0 | 1,013.1 | 992.1 |
| Turkey | 5.4 | 6.8 | 6.5 | 6.5 | 6.2 | 6.3 |
| Total Middle East | 4,159.9 | 4,186.4 | 4,414.2 | 4,534.0 | 4,325.6 | 3,575.9 |
| British Borneo | 117.0 | 117.1 | 117.1 | 117.2 | 117.2 | 117.1 |
| Burma | 7.9 | 7.9 | 7.9 | 7.9 | 7.9 | 7.7 |
| China (Communist) | 30.0 | 30.0 | 40.0 | 40.0 | 35.0 | 40.0 |
| India | 9.2 | 9.1 | 8.6 | 8.6 | 8.9 | 9.1 |
| Indonesia | 292.0 | 323.0 | 310.0 | 315.0 | 310.0 | 314.7 |
| Japan | 6.1 | 6.1 | 6.1 | 6.1 | 6.1 | 6.2 |
| New Guinea | 5.4 | 4.0 | 5.3 | 4.7 | 4.8 | 6.3 |
| Pakistan | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.9 |
| Total Asia & Australasia | 473.0 | 502.6 | 500.4 | 504.9 | 495.3 | 507.0 |
| TOTAL EASTERN HEMISPHERE | 7,321.7 | 7,463.8 | 7,427.1 | 7,917.4 | 7,608.1 | 6,528.5 |
| WORLD TOTAL | 17,689.4 | 17,458.1 | 18,379.8 | 18,862.3 | 18,098.9 | 17,662.6 |

by independent producers, is to insulate the USA against the effect of lower-cost foreign oils. On this basis of operation, the demand for USA crude in 1959 should rise about 333,000 b/d and bring with it an increase of 40,000 b/d in natural-gas liquids. Outside the USA, an increase in production of about 660,000 b/d—over half of which will be lifted from wells in the Soviet Union, leaving a little over 300,000 b/d for expansion of output in the remainder of the world. This situation could be changed radically if imports into the USA are permitted to increase to any great extent. Lacking such a shift in policy, it seems apparent that the rate of expansion in Middle East production will be somewhat retarded in 1959.

During the past year, the regional growth pattern in crude production was abnormal compared with 1957 when the Suez stoppage caused a bulge in demand for Western Hemisphere oil and restricted Middle Eastern fields to virtually no gain. Result was the West supplied all of western Europe's increase in demand. This year the Middle East picked up not only the normal European market growth, but also that portion of the market which was lost to the West in 1957 and 1956. Increase in production in the area thus was 755,700 b/d over the previous year. Increase in Middle East output in the past five years has been as follows:

| | Barrels Daily |
|---|---|
| 1958 | 756,000 |
| 1957 | 88,000 |
| 1956 | 209,000 |
| 1955 | 496,000 |
| 1954 | 313,000 |
| Average | 372,000 |

An accompanying chart shows the growth in Middle East production during the past decade, and traces the shifting volume of output by various countries. Particularly interesting is the steady rise, except for the Suez period, despite the cessation of production in Iran in 1952 and the loss of output in Iraq when its pipeline outlet to the Mediterranean was cut off by sabotage.

Table II is a report by quarters on production of crude oil in 1958 throughout the world, compared with daily average figures for the full years 1957 and 1958. Table III is an analysis of the share of world crude markets enjoyed by principal producing nations and geographical regions. Despite the Suez dislocation, this tabulation reveals the steady increase in the Eastern Hemisphere's share of the market which has risen from 33.6% in 1954 to 42.1% last year, an average gain of nearly 2% per annum.

With USA oil consumption expected to leave the plateau on which it has rested for the past two years and resume its rise at the historic rate of more than 4%, with other world markets expected to expand at a much faster rate, it seems likely that the international petroleum industry has an opportunity to enjoy a year of reasonable prosperity if inventories can be maintained at a reasonable level and costs held within bounds. The second century of oil thus should begin auspiciously. END

CECIL W. WOOD, F.R.I.C., F.Inst.Pet., who has had long experience in oil journalism and a wide general knowledge of the industry, has joined the London staff of *World Petroleum* as European editor. For many years editor of *The Petroleum Times*, he was the author of the unique 50-year record of the UK oil-industry highlights compiled as that journal's Jubilee Number.

Recently Mr. Wood has been engaged in recording worldwide developments and in statistical work for the Petroleum Information Bureau in London. He also has compiled brochures dealing with various spheres of technical progress for the Council of British Manufacturers of Petroleum Equipment.

Because of his unique background of experience in the industry, his future reports on the oil industry in the United Kingdom, the continent of Europe, and elsewhere in the Eastern Hemisphere will be of great interest to the readers of *World Petroleum*.

# The UK—a heavy-oil economy

by Cecil W. Wood

***Fuel-oil deliveries in 1958 were running 50% ahead of 1956, fuel for electricity doubled in the year, and domestic use of distillate fuels is growing rapidly.***

WITH but one month to go, a broad assessment of the UK oil-industry picture for 1958 can be presented. In all directions, the year has been one of great activity in preparation for higher oil demand, and in no field has progress been more significant than in petrochemicals. Trading has been keenly competitive in the face of a world oil surplus at a time of a minor industrial recession, but trading results are likely to be better than anticipated at one time.

Signs of recovery from this recession are seen already, but there is general agreement that full recovery is not yet in sight. A welcome sign is the lessening in the trade gap over the first 10 months to £345.5 million from £580.5 million in the same period of 1957. Even more encouraging factors are October's record trade with the USA and the fact that sales of British goods have kept up all through the American recession. Further, sales to Canada have resumed their upward trend. Many such factors could be quoted which must influence production and thus, ultimately, oil demand.

The last industrial production index available is 105 against a 1957 average of 108, and a slight further decline is expected. As to individual production categories in the first nine months, the only major item to show a rise in the basic materials and capital goods class is the commercial vehicle class—to 229,611, a rise of 12.0% over the 1957 period; while in the consumer-goods class passenger-car production rose 29.2%, to 782,996. The steel industry, another major oil consumer, is bearing much of the burden of the recession, and here there has been a decline in production of 8.6%, to 14.8 million tons*, over these comparative periods: This decline is stated to have been due in part to a drop in oil-company orders for tubular goods.

*Capital Expenditure.* The level of oil-industry activity is reflected in the high figure for capital expenditure. Ministry of Power *Statistical Digest* reveals a record figure of £108 million for 1957, and spending in recent years is summarized in Table I.

Table I
*UK OIL-INDUSTRY CAPITAL EXPENDITURE.*

| | *1954* | *1955* | *1956* | *1957* |
|---|---|---|---|---|
| | *Million £ Sterling* | | | |
| A. Petroleum and shale-oil refining— | | | | |
| Plant, machinery, and vehicles | 13.5 | 10.9 | 17.7 | 34.7 |
| New building and civil engineering work | 2.8 | 2.3 | 4.3 | 7.5 |
| B. Other capital expenditure— | | | | |
| Ocean tankerage | 16.4 | 13.4 | 17.5 | 34.6 |
| Wholesale and retail distribution, research, etc. | 6.2 | 9.5 | 18.6 | 31.2 |
| Total | 38.9 | 36.1 | 58.1 | 108.0 |

*All tons in this review are long tons (2,240 lb), except where otherwise stated.

It seems certain that the high level of 1957 spending continued through 1958, and it may have increased. It has been stated officially during the year that a total of £250 million has been invested in refining alone from 1948 to 1957, and that subsidiaries of American oil companies have spent a gross sum of £95 million on UK refineries since January 1946.

This spending has enabled refiners to meet the increased demand which has raised oil's share in the primary inland fuel-consumption pattern over the last decade, from 9.1% in 1947 to 15.1% in 1957. Over this period, coal's share fell from 90.7% to 84.2%.

*Equipment Orders:* Oil-equipment manufacture has continued to grow in volume and range, and the already close links with specialist American firms continue to be strengthened. For instance, 1958 saw construction of the first British-made mobile drilling platform in association with the American designers.

There is now official admission of the value to British economy of this relatively new sphere of British industrial enterprise, and a striking witness to the growth in specialization was seen in the 1958 Chemical and Petroleum Engineering Exhibition—so successful that already a larger exhibition is being planned.

Unfortunately there has been a decline, believed only temporary, in the total value of orders placed by oil companies in the UK for materials and equipment (excluding tankers). For January-September, the total was £89.5 mm against £101.3 mm in the same period of 1957. The full 1958 total is likely to be around £120-125 mm against the 1957 total of £134 mm.

Some striking differences are to be noted over the comparative periods. Whereas orders for "specialized equipment for refineries (excluding pumps and valves)" rose by £3.3 mm to £6.5 mm, those for "tubulars, pipe fittings, and valves (ferrous and non-ferrous)" and for "specialized equipment for oil drilling and production (including oil casing, tubing, and drill pipe)" showed declines of £7.1 mm (to £11.2 mm) and £6.6 mm (to £7.9 mm) respectively. The effect of these declines on steel production is obvious.

During the year the Council of British Manufacturers of Petroleum Equipment published for the first time an analysis of these orders, designed to show the proportion of "equipment proper" as against "consumables" in the 1953 to 1957 totals. This ranges from 55% to 70%, and is likely to be about 60% in 1958. The Council of British Manufacturers of Petroleum Equipment continues to grow in influence, and its members now total some 450 specialist firms.

A recent interesting development has been the registration of The Oil Companies Materials Assn. as a "company limited by guarantee" for the standardization and specification of materials and equipment used in the oil industry. Original subscribers cover all the leading British companies, with producing and refining interests ranging all over the world.

*Imports, Exports, and Prices:* Comparison of imports and consumption between the past two years is inevitably bedevilled by the 1957 restrictions flowing from the Suez Canal seizure. These were more severe than anywhere else in western Europe. Based on the January to September statistics—with total imports at 8,403 mm gallons (value £309.0 mm) against 7,556 mm gallons (£334.7 mm). Details for the past three years are given in Table II.

Table II
*UK OIL IMPORT-EXPORT TRADE*

| | 1956 | 1957 | Estimated 1958 |
|---|---|---|---|
| Imports: | | | |
| Crude oil, millions of imp. gal. | 7,410 | 7,243 | 8,600 |
| Refined, millions of imp. gal. | 2,483 | 2,858 | 2,800 |
| Total | 9,893 | 10,101 | 11,400 |
| Increase over preceding year, % | 4.4 | 2.1 | 13 |
| Exports of domestic produce: | | | |
| Quantity, millions of imp. gal. | 1,901 | 1,570 | 2,100 |
| Value, £ mm sterling | 92.1 | 83.1 | 93 |

Unit cif import values of both crude and refined oils as a whole showed a decline of about 2% between January and September. The decline in fuel oil, however, was higher at 8.6%, from 8.58 to 7.84 pence per gallon. Motor spirit alone showed a rise, and then only slightly. Product retail prices showed the same general slight downward trend except for diesel-engine road fuel.

*Petrochemical plant at the Fawley refinery of Esso Petroleum Co. Ltd.: Steam cracker furnaces are in the left foreground; ethylene-recovery and purification equipment in the center; butene-feed preparation, dehydrogenation, and butadiene recovery in the background. The plant was officially opened in December 1958 (Esso photo).*

*Aerial view of construction work at British Petroleum Co.'s new tanker terminal at Milford Haven, South Wales: The 1,350-ft approach arm and 2,300-ft jetty head will have two berths for the largest tankers. In the foreground is Popton Fort which is being converted into administration offices (BP photo).*

*Fuel Policy:* The government's fuel and energy policy came in for growing criticism during the year in the face of rising stocks of small coal and greater use of fuel oil and, in particular, it has been pressed to drop the policy of switching to oil from coal at power stations. For instance, the South Eastern Electricity Board recently completed its first conversion at the largest and most modern of three stations generating a total of 480 megawatts.

The answer to criticism and pressure is that it is still the government's firm conviction that net oil imports do not constitute any strain on the economy; that British participation in the international oil industry brings substantial trade and financial advantages, and thus coal and oil must be allowed to compete purely on their respective merits.

British oil companies' contribution to national economy, though admitted to be of major importance, has always been grouped among "invisible earnings," and is thus unknown. It has been announced recently that the Board of Trade is to collect publishable statistics relating to profits, interest, and dividends received and earned by British companies in respect of their overseas operations, subsidiaries, and associates. Knowledge of such overseas earnings would be of the greatest interest.

*Refining:* Refining capacity has taken a big step forward, being estimated at 36.0 mm metric tons (720,000 b/d) at mid-1958, and likely to be relatively unchanged at the year-end. This compares with 33.5 (670,000 b/d at end-1957 and 31.0 (620,000 b/d) end-1956.

The year has seen much needed earlier oil information in the Central Statistical Office's *Monthly Digest of Statistics*. This now includes tables on (a) refinery input and output, (b) deliveries into inland consumption, and (c) main end-uses.

A measure of the higher rate of processing is that over the first eight months of 1958 total throughput was 21.2 million tons against 17.9 mm in the same period of 1957. July and August throughputs were exceptionally high at the record rates of 35.3 mm (706,000 b/d) and 34.0 mm tons a year (680,000 b/d) respectively. On this basis, processing was approaching the full capacity available on a normal basis. With this late increase, it is difficult to assess the likely 1958 total; it is possible it will be 32-33 mm tons (640-660,000 b/d) against 27.8 mm (556,000 b/d) in 1957 and 28.7 mm (574,000 b/d) in 1956.

The major refinery expansion project completed in 1958, and largely accounting for the year's increase, was that at British Petroleum's Kent refinery, raising capacity from 4.6 mm metric tons a year (92,000 b/d) to 7.1 mm (142,000 b/d) at a cost of some £26 mm. This brings total capital expenditure on this plant to some £75 mm, and already there are reports of further developments. The most important unit is undoubtedly the 130,000 tons per day (2,600 b/d) alkylation unit, producing high-grade aviation gasoline for the first time. At British Petroleum's Grangemouth refinery expansion is nearing completion to 3.1 mm metric tons (62,000 b/d) from 2.2 mm (44,000 b/d) at a cost of £4 mm.

Completion of expansion at Shell Haven from 3.75 mm metric tons (75,000 b/d) a year to 7.75 mm (155,000 b/d) is not yet announced, but this is expected early 1959. A recent new project comprises a 200-ton-per-day (1,400 b/d) fuel-oil gasification plant as base material for making synthetic nitrogen fertilizers. At Stanlow, Shell is constructing an £800,000 plant to produce an important aviation-gasoline component.

The first stage is nearing completion of Mobil Oil's new LPG recovery plant at Coryton. A substantial quantity of propane will be available shortly, and butane supply will follow.

At Milford Haven (South Wales) Esso Petroleum has started building a 5.0 mm metric-ton-year (100,000 b/d) refinery and a 3,500-ft jetty to take up to 100,000-ton tankers. The cost of this project is put at £18-20 mm; and it has been claimed that this plant, when completed in 1960, together with Fawley—recently expanded from 150,000 to 210,000 b/d—will be capable of meeting some 37% of anticipated UK domestic consumption at that time.

*Storage:* Storage and tanker terminal projects have been so numerous that only some of the major ones can be mentioned.

At Finnart, terminal for the trans-Scottish pipeline to the Grangemouth refinery, British Petroleum has completed its £2 mm project providing discharging facilities for the largest tanker foreseeable (previously the limit was the 32,000-tonner). The company also has a storage terminal in the making at Milford Haven, with berths to take the largest tankers and a pipeline linking with the Llandarcy refinery.

At Tranmere, there is a joint plan by Mersey Docks and Harbour Board and Shell Refining Co. for deep-water berths to accommodate 65,000-ton vessels, with a pipeline to link with Shell plants at Stanlow and Partington. In full operation, the movement of eight million tons a year is envisaged.

Esso Petroleum has started work on a new £1½ mm storage terminal at Avonmouth (Bristol), and is planning a £2 mm Tynemouth (Co. Durham) installation, while Shell and Tidewater jointly have been given planning permission for a large bulk terminal at Holyhead (Anglesey), and there has been reference to the possibility of a "large" refinery there.

*Aid to Town Gas:* A feature of the year was the growing interrelationship of the petroleum and coal-gas industries. Gas is being drawn increasingly from various refineries, and oils are being drawn into service in several other ways.

Refinery gas-supply contracts announced in 1958 cover some 60 mm therms a year, while at March 31 last the Gas Council reported 58 oil-gasification plants operating

*(Continued on page 52)*

# THE JOB AHEAD

by Austin Cadle*

*With a population of over two billion by 1975, the noncommunist world will need 21 million barrels more oil daily than in 1957. New investment must reach $1 billion each year for new refineries alone.*

THE RAPID economic progress of the 20th century has witnessed an enormous increase in the use of heat and power. Petroleum fuels, because of their wide variety, their technical adaptability to automotive and heating equipment, and their economic availability, have supplied a progressively increasing share of expanding energy requirements. As a result, petroleum has been one of our great growth industries, and its development abroad has attained spectacular proportions in recent years.

*The Plateau of 1957 and 1958:* About mid-1957, United States petroleum demand consummated several years of expanding growth to arrive at a plateau from which it is now resuming its climb toward higher elevations.

The year 1959 should witness an increase in domestic demands of 4% or better. I would expect gasolines to approximate such a demand increase, and jet fuels to increase by some 11%. Even distillates and residual fuel oil should gain somewhat, despite competition from natural gas. Thus demands should be getting back on the trend to continually higher elevations as succeeding years unfold.

In the total free foreign area, demands next year should increase by approximately 11%.

Fundamentally, markets for petroleum products are made by people. Any appraisal of future consumption would be hazardous if it did not examine basic trends in population, and recognize the significance of differential rates of growth.

Forecasts indicate that the free world's population will exceed two billion by 1975, an increase of about 30% over today's level of 1.6 billion. Much of this growth is attributable to foreseeable reductions in death rates brought about by advances in medical science, as well as to increased birth rates.

Fig. 1. illustrates that regional rates will differ significantly. United States population is expected to grow by 33% in the next 18 years to 227 million people. The fastest regional growth is anticipated in the Western Hemisphere outside of the United States, where 1975 population is forecast at 291 million, or 50% over today's level. Western Europe's population is likely to show the slowest rate of growth, increasing only 12%, to a total of 352 million. One of the principal reasons for this relatively slow rate of growth is the anticipation of continued high emigration.

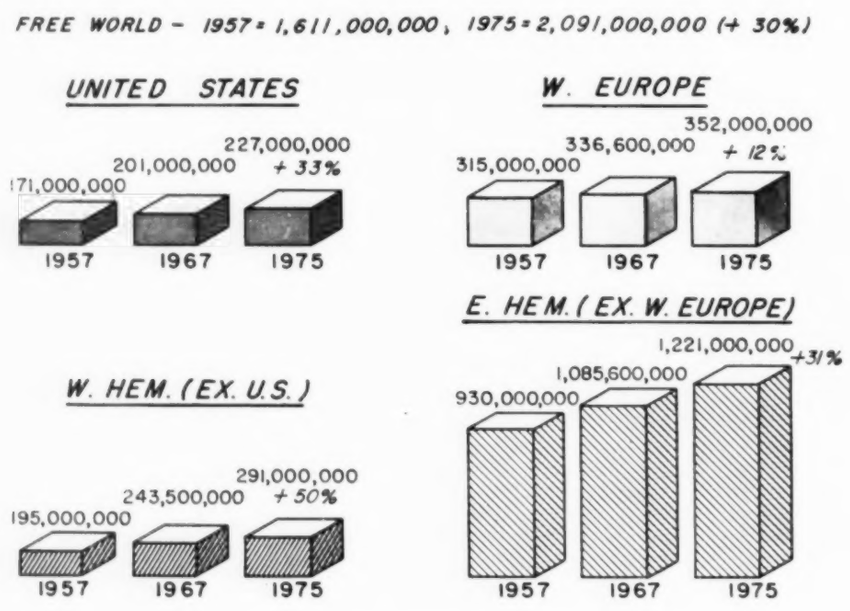
From the standpoint of sheer numbers, the greatest population growth in the major regions of the Free World is expected to occur in the balance of the Eastern Hemisphere, where 1975 population will total over 1.2 billion, or 31% greater than today's level.

*Total Energy Requirements:* Rates of growth in population become meaningful only when related to the state of economic development peculiar to an area. Of several yardsticks used by economists, a measure of total energy requirements is particularly useful. The energy market available to oil will remain a major determinant of future petroleum demands.

In the United States oil products compete with coal and natural gas, and in Western Europe coal and oil are the competitive fuels. Throughout other areas, growth in total energy requirements is equally significant, as oil, by and large, is the incremental economic fuel.

Energy requirements have increased consistently in the past, except during periods of world war and depression, at an average

*Fig. 1 Estimated Growth in Free World Population.*




*Manager of the economics department, Standard Oil Co. of California, San Francisco, Calif.; presented before the American Petroleum Institute, Chicago, Ill., Nov. 11, 1958 under the title "United States Petroleum Forecast and Dynamic World Growth in Petroleum Demands."

rate exceeding 4% per year. This rate reflects not only demands created by expanding population, but also those occasioned by increased productivity.

One-half of the world's energy requirements arises in the United States, and some 46% is met by petroleum. Despite the extent to which our country has outdistanced the world in the use of energy, it will continue along an expansionary trend.

By 1975, total free world energy requirements will practically double, reaching the staggering figure of 75 million barrels daily in oil equivalent. Of this total some 50% will be met by petroleum, a figure which indicates both an absolute and a relative overall gain for petroleum marketers.

Referring to Fig. 2, it is apparent that regional differences are again significant. In the United States, a figure of 35 million equivalent barrels daily should be reached by 1975, an 83% increase. Lesser absolute increases, but at faster rates, will occur in the Western Hemisphere outside the United States, at 161%, and in the Eastern Hemisphere excluding Western Europe, where energy demands will rise 142%. In Western Europe, requirements should be about 73% over today's level.

*Growth in Petroleum Demands:* From region to region we expect total petroleum demands to change as follows:

| | 1957-1975 Change in Petroleum as Percent of Energy Requirements | Increase in Million B/D | Percent Increase |
|---|---|---|---|
| United States | — 2 | 6.7 | 76 |
| Western Europe | +22 | 6.3 | 229 |
| W. Hemisphere (ex. USA) | + 4 | 4.0 | 174 |
| E. Hemisphere (ex. W. Europe) | +14 | 4.3 | 214 |
| Free World | + 9 | 21.3 | 134 |

Fig. 3 illustrates rates of growth anticipated for principal petroleum products from 1957 to 1975. These may be summarized as follows:

| | Motor Gasoline % | Distillates % | Fuel Oil % |
|---|---|---|---|
| United States | 100 | 47 | 46 |
| Western Europe | 178 | 234 | 259 |
| W. Hemisphere (ex. USA) | 195 | 182 | 135 |
| E. Hemisphere (ex. W. Europe) | 214 | 226 | 202 |

Reasons underlying these rates of growth differ from region to region, and it is worthwhile to examine factors affecting demands in each of the four major regions, by major products.

*United States Petroleum Demand—Gasoline:* In the future, total gasoline demand is anticipated to grow under the continuing impact of growing population, multi-car families, shorter working hours, and longer vacations. Declining uses of aviation gasoline will be more than offset by jet fuel for rapidly expanding air travel. By 1975, motor gasoline (of whatever type it may be) and jet-fuel demand will exceed 50% of total domestic consumption of petroleum products and be roughly double 1957 levels.

*Distillates:* Chief growth factors underlying distillate demands are associated with mobile and stationary power uses. Expanded construction and road-building activity will increase diesel demands at a rate of growth paralleling motor gasoline. The railroads will be completely dieselized. However, these gains will be partially offset by slower rates of growth in heating-oil markets (owing to increased availability of natural gas) and by expanding use of residual fuel oil in diesel engines. By 1975, distillates will total only about 16% of total domestic sales, but this will represent a 47% increase over 1957 volumes.

*Fuel Oil:* Of all major products, fuel oil will probably suffer the greatest competition from alternative sources of energy. Increasing availability of natural gas will result in gradual displacement of residual fuel in industrial and electric plants in the western states, but will be offset by expanding northeastern markets. A further offsetting factor may be the trend towards burning heavy fuel in rail and marine diesel engines. In 1957, United States fuel-oil demand totaled 1.5 million b/d, 17% of the total. By 1975, this demand is forecast to increase to 2.2 million b/d, constituting only 14% of a total product barrel.

*Free Foreign Petroleum Demand:* Overall product demands in foreign areas are increasing at treble the rate in the United States, with the greatest increase occurring in western Europe. For simplicity, I shall treat the free foreign area as one large unit, pointing out regional differences by product.

*Gasoline—Western Hemisphere (excluding USA):* In Canada and Latin America air travel has grown rapidly. Airlines have expanded passenger services at the expense of sea and rail transport. As the 1960's usher in the "Jet Age," jet demands will spiral, more than offsetting decreasing rates of increase for aviation gasolines.

Motor gasoline demand in this area should grow rapidly as incomes increase and become more evenly distributed. Both Canada and Latin America are many years away from saturation in vehicle ownership per unit of population, and well below United States levels. We may expect continued growth in vehicle registrations. Government-sponsored highway programs are gaining momentum. This is particularly significant in Latin America which has few railways. Our foreign policy encompasses aid to South America. For these reasons gasoline demands will treble by 1975.

*Western Europe:* In Europe, ratios of vehicle ownership are modest when measured by United States standards. Increasing industrialization, development of the Common Market, a trend towards increased standards of living, and government highway programs all indicate a promising future for motor-gasoline demand. European contacts with North America and Asia are increasing. The time-saving possible

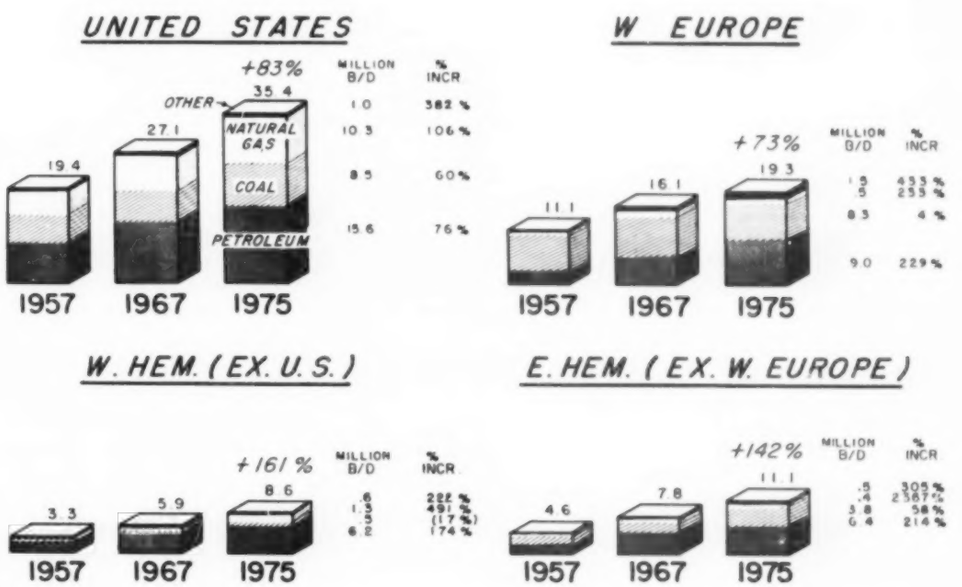



*Fig. 2 Estimated Pattern of Energy Consumption in the Free World.*

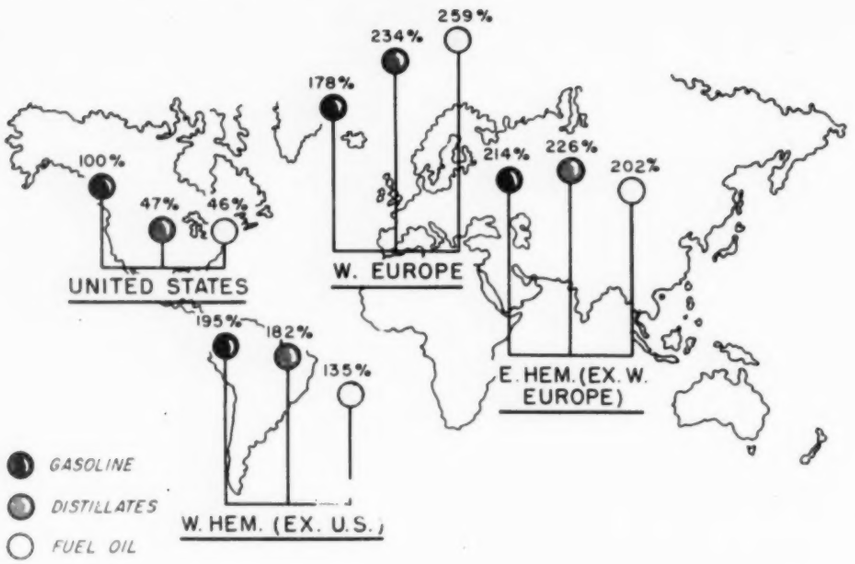



*Fig. 3 Estimated Growth in World Petroleum Major-Product Demands, 1957-1975.*

through jet airlines will accelerate the pace of European business—this means growing jet-fuel demand, as well as continuing high avgas demands for a decade. Total gasoline demand by 1975 will be triple the 1957 level and reach some two million b/d.

*Eastern Hemisphere (excluding Western Europe)*: Asia and Africa are vast in terms of area, population, and latent large-scale economic development of natural resources. By western standards, many of these countries endure extremely depressed living conditions. The man who barely ekes out a living hardly adds to motor-gasoline demand. Yet one can envisage the latent demand existing when industrialization and overall economic development encompass these underdeveloped countries. Even modest increases in income levels could materially add to vehicle registrations. Air travel, too, will increase demand and continue to outgrow rail and sea transportation. Unlike the other areas, demand for aviation fuel in the Eastern Hemisphere may remain strong as these countries acquire displaced piston-type aircraft from more developed countries. In short, total gasoline demand will more than treble by 1975.

*Distillates—Western Hemisphere (excluding USA)*: In countries such as Canada, Mexico, and Argentina, natural gas will invade industrial fuel and home heating markets. Thus increases in demands for heating oils will be limited to areas where a competitive advantage over solid fuels continues. The strongest advances in distillate demand will occur in highway, agricultural, and construction diesel-engine use. Growth in rail and marine use will be limited as dieselization nears completion and residual fuel oil makes inroads on these markets. By 1975, gas-oil demand in this region will triple and roughly make up 20% of all product demand.

*Western Europe:* Europe is on the threshold of large-scale distillate demand. Low-cost natural gas is not available to the extent that it is in North America. Coal has become less available locally at competitive prices. Even imports of United States coal appear to be an unlikely long-range competitor, owing to rising costs. In addition, European railways are just beginning to undergo extensive dieselization. Diesel fuel appears to be the natural economic fuel for automotive uses. Diesel will be used increasingly in Europe for construction and industrial equipment. As standards of living increase, space-heating uses of distillates will assume proportions similar to North America. Under the impact of these forces, distillate demand will more than treble by 1975.

*Eastern Hemisphere (excluding Western Europe)*: In several countries of Asia and Africa, a sizable conversion to heating oils from solid fuels should occur as the latter become more costly. Natural gas is not expected to be available through most of the area. As economic development progresses, greater reliance on distillates will occur—diesel-powered equipment in agriculture, heavy construction work, and road and rail transportation. Demands for distillates, including kerosine, will probably treble by 1975, reaching 1.2 million b/d.

*Fuel Oil—Western Hemisphere (excluding USA)*: Fuel-oil use in industrial plants, in electric utilities and steam vessels, and in heavy-duty diesel engines is expected to grow about 2½ times the 1957 levels by the mid-seventies. Natural gas in countries such as Canada and the Argentine will undoubtedly displace some fuel oil and coal. In other areas, fuel oil itself will displace less economic solid fuels.

*Western Europe:* Fuel-oil demand in western Europe will nearly quadruple to 1975. Fuel oil's primary function will be to fill the gap between energy requirements and domestic fuel supplies. In addition, petroleum will increasingly replace coal as the primary source for industrial fuel and electricity generation. Europe has limited undeveloped hydro potential, and has little natural gas. It, therefore, must depend on coal, on oil, or on nuclear fuels to supply its new energy. Coal production is expensive, and is expected to lag behind requirements. Even with abnormally low freight rates, imported United States coal is already expensive in Europe. Nuclear-generated electricity is not likely to be competitive costwise until the latter 1960's, owing to high capital costs. Oil becomes the incremental economic fuel. Thus, on balance, 1975 residual fuel-oil demand should exceed 3.8 million b/d, some 42% of total product demand.

*Eastern Hemisphere (excluding Western Europe):* In Asia and Africa, 1957 fuel-oil demand totaled less than 900,000 b/d. By 1975, this demand will reach 2.6 million b/d. In this region oil's competitive position will vary greatly from one area to another. In Japan, where coal is expensive, water power is highly developed, and natural gas is scarce, fuel-oil demand will loom large. On the other hand, in Indo-China, India, the Union of South Africa, and a few other countries where coal is produced at very low cost, oil will be hard-pressed to displace coal. Yet the outlook for oil is relatively favorable, as coal is unlikely to become a major export of any country within this area, as fuel-wood and other noncommercial fuels become scarce, and as energy requirements increase significantly under the impact of national and international development programs.

*Nuclear Energy:* A discussion of long-term future demands would not be complete unless we touch upon the outlook for peaceful uses of nuclear energy. Production of electricity is the furthest advanced, but it is still far from being economically competitive with liquid fuels or coal. A number of plants are under construction, and more are planned both in Europe and the United States; but the combined capacity of all

plants scheduled by the mid-sixties is considerably less than the capacity added to the United States total power system in the course of a single year. On the basis of current cost predictions, it is difficult to visualize any extensive development of nuclear power plants for another 10 or 15 years. Even if all such installations in the long-term future were to be nuclear, it would replace a very small percentage of the total consumption of liquid fuels.

There are good possibilities for nuclear propulsion of merchant ships, which currently absorb 1.5 million b d of oil. However, the effects upon total petroleum demand will not be pronounced, as the consumption of petroleum in bunker uses is small relative to volumes of gasolines and other products.

The use of oil in naval vessels will be drastically curtailed during the next 10 years as nuclear propulsion is introduced, but this likewise does not represent a loss of a major oil market.

*Refining Facilities Needed by 1975:* In the foregoing, I have dealt with growth patterns in product demand. Directly associated with these are requirements for new refining, transportation and marketing facilities, as well as availability of ample supplies of crude oil.

It is not the intention to go into the ramifications of these situations. Let it suffice merely to show a final chart that defines the approximate requirements for refineries to satisfy the demands which have been estimated. In support of these refineries, it may be said that the world contains ample proved and potential reserves of crude oil, and I would estimate that some 6,500 T-2 equivalent tankers would be required for transportation, vs. 2,300 in 1957.

In 1957, free world crude refining capacity totaled 18 million b/d. Of this, 52% was located in the United States, 19% in other Western Hemisphere, 17% in western Europe, with the remaining 12% in other Eastern Hemisphere.

Predicated upon the demand patterns as outlined, 1975 free world refining requirements will increase by about 136% to around 42 million b/d. On a rule-of-thumb basis, this would mean new fixed investment charges of about 20 billion current dollars in the next 18 years, or a little over $1 billion per annum. Add to this a need to provide terminal storage facilities, marketing outlets, as well as crude and product transportation media, and you could readily come to an investment figure staggering to the imagination.

Fig. 4 indicates regional refinery capacity required. United States refinery capacity will have to be increased from 9,400,000 b/d to about 16,500,000, or 76%. The balance of our hemisphere will almost have to triple its capacity—to some 9,000,000 b/d. Europe should more than triple to 10,200,000, and the balance of the Eastern Hemisphere must go from 2,100,000 to 6,600,000 b d, an increase of 214%.

In addition to new problems surrounding quality requirements of the future, the refining branch of the industry will be faced with a need to shift yield patterns to meet product demands. In the United States, Canada, and Latin America, demand patterns show a growing emphasis on light products and declining fuel oil. Excepting to the extent that Caribbean refiners will continue to supply a large portion of the fuel-oil requirements of North America and Europe, there will be a marked need for more upgrading facilities.

In Europe, the emphasis will be heaviest on the black oils, with probably some downgrading of current yield patterns. The pattern of yields required in the balance of the Eastern Hemisphere shows very little change. Refining in this area may swing more in the direction of topping operations, coupled with catalytic reforming to achieve a necessary balance of yield patterns and gasoline quality.

*Conclusions:* It is hoped that I have sufficiently emphasized the outstanding features of petroleum's future to make it unnecessary to reiterate other than a few major features, viz.:

1. Demands have by no means reached a saturation point in the United States petroleum industry.
2. The future pattern in the underdeveloped areas of the Western and Eastern Hemispheres is one of rather astounding future expansion in the use of petroleum.
3. Western Europe shows even greater potentialities; and in that area, as well as the balance of the Eastern Hemisphere, the prospects for distillates and residual fuel oil exceed the percentage increases expected for gasoline.
4. These increases in demand translate into a growing need for huge development of crude-oil production and for the building of transportation, refining, and marketing facilities.

Finally, I am convinced that the future holds many opportunities for the petroleum industry. The increase in demands for its products will be truly dynamic. There is nothing on the horizon which can destroy its continuance as an outstanding growth industry, in foreign areas as well as in our own country. END

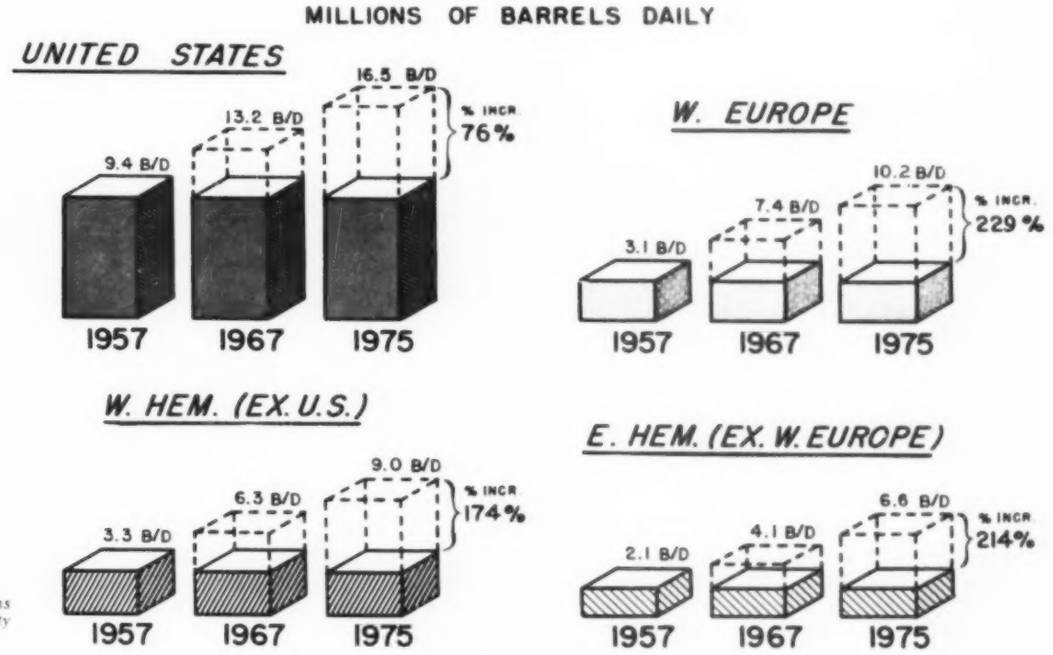
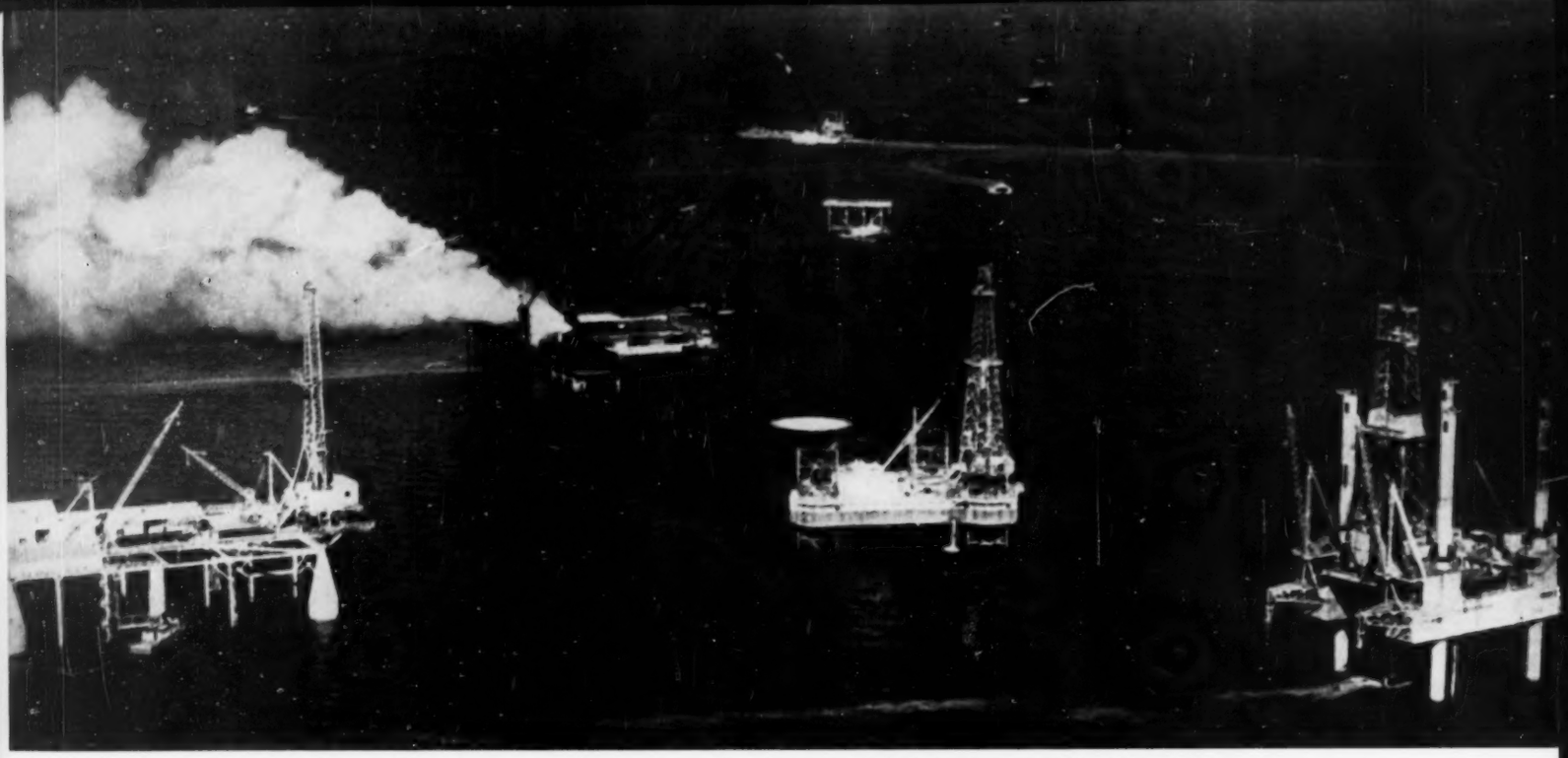



*Fig. 4 Estimated Additions to Refining Capacity Needed by 1975.*



*Scene of the CATC offshore platform fire at a time when two of the seven wells were still burning. Near the burning area can be seen a derrick barge removing debris, a special fire-fighting barge, and a work platform from which to fight the fire. In the foreground are the three mobile barges sent to the area to drill relief wells. At left is Kermac rig No. 16, a submersible barge, drilling over well "E-5." Rig at center is the LeTourneau-type mobile platform "Vinegarroon," and to the right is the mobile platform "Mr. Gus II." The latter two rigs were drilling to the four producing horizons of well "E-7." In the background is a production platform in the process of being erected to serve as a junction for a network of pipelines to other platforms in the field.*

# DISASTER ON PLATFORM "E"

by James W. Calvert

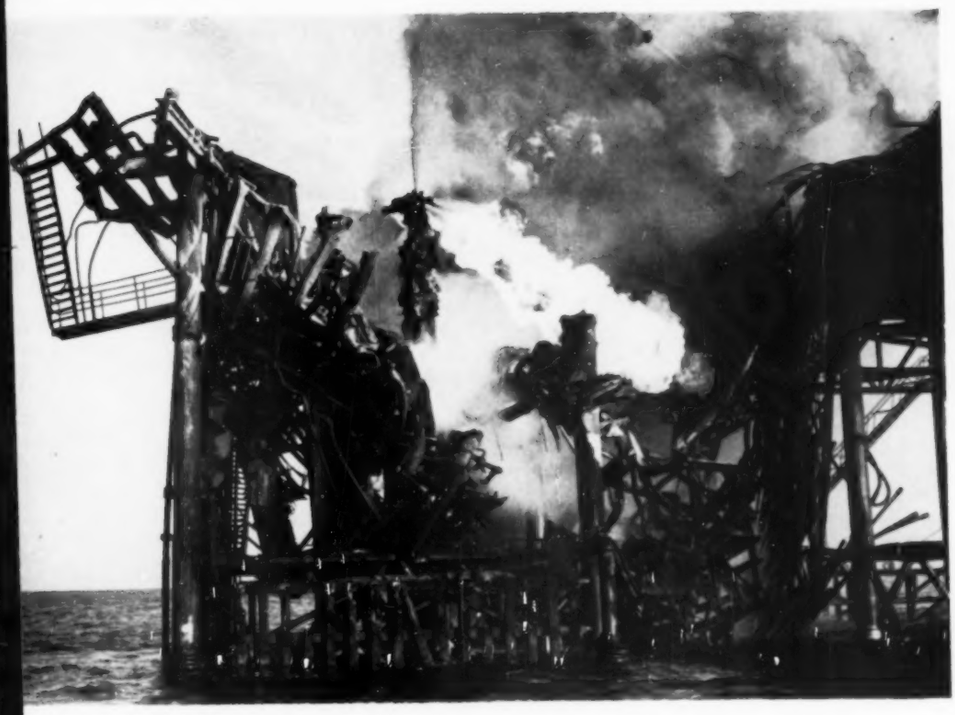
*US Coast Guard inquiry seeks to determine cause of October fire. Meanwhile operators of offshore wells are installing downhole controls despite sanding difficulties. Much higher insurance rates threaten to further inflate costs.*

THE OIL and gas industry has long since determined that multiple-well completions and the drilling of several directional holes from a single platform afford the most likely approach to anything like a profitable operation in the offshore fields of the Gulf of Mexico. Cost of construction at sea, delays and shutdowns occasioned by bad weather, use of expensive transportation have put the cost of petroleum prospecting beyond the reach of any but the industrial giants and the syndicates of oil companies which have pooled money and resources to tap the rich reserves beneath ocean beds.

Multimillion-dollar structures or "artificial islands," as they are known officially to the US Coast Guard, dot the Gulf of Mexico off the Louisiana and Texas coasts. Some of them are large enough to accommodate eight, twelve, or as many as sixteen directional wells, with each hole tapping two or more producing horizons.

One of the most successful proponents of this technique of multiple production has been the CATC group—a syndicate composed of Continental Oil Co., The Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co., with Continental the operator for the group. In the fall of 1957, CATC made industry history by successfully completing the first offshore triple-producer, and only last summer broke its own record by completing a

*This picture, taken from the fire-fighting barge, shows water being played on the flaming platform. High-pressure nozzles were hastily rigged in an effort to cool the steel structure so that surface work of controlling the wild wells could get under way.*



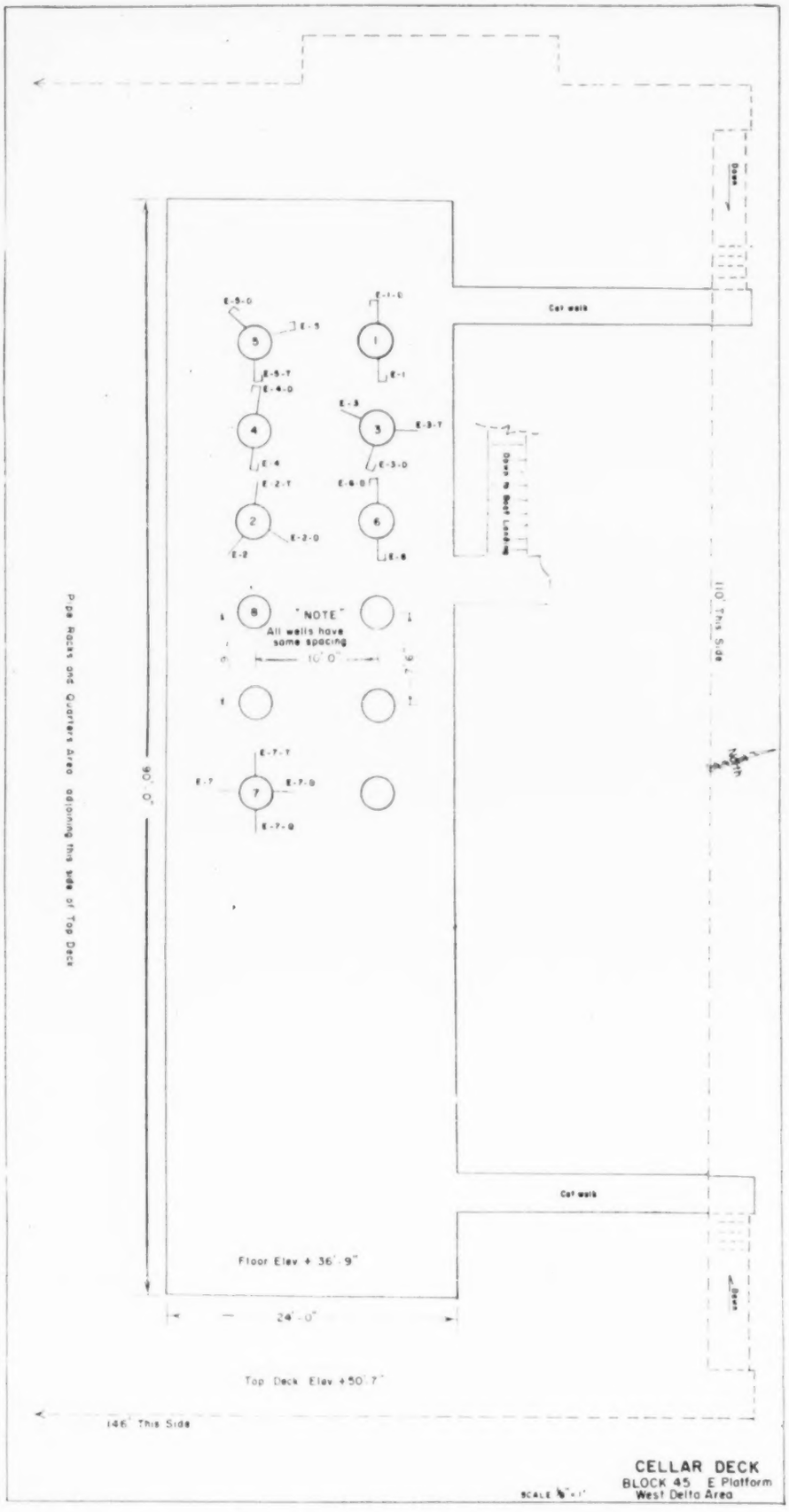
*All that remained of the giant platform a few hours after the fire had started. The twisted mass of steel was the area of the drilling platform and, below it, the cellar deck.*

quadruple-pay well, or four production horizons in a single hole.

These two record-setting wells and many other multiple completions, are situated in the West Delta area, a field characterized by troublesome sand incursions which has made necessary the extensive use of plastics for sand consolidation and other methods of sand control. Geographically, it is located some 21 miles from land in 50 ft of water, due west of the mouth of the Mississippi River and about 60 miles (by helicopter) from New Orleans.

CATC's big "E" platform in Block 45 of the West Delta area was no different, in many respects, from other self-contained drilling platforms. The structure was 146 ft long and 110 ft wide, its main deck rearing more than 50 ft above the surface of the sea.

Like most structures of this kind, platform "E" had been constructed so that the southeastern end of the "island" contained the airconditioned quarters for the crew, offices, messing and recreational areas, in a building which was topped with a helicopter landing. The midsection contained facilities for storage of mud, cement, pipe, and other drilling supplies. On the northwest end of the platform was the derrick floor where, potentially, could be drilled as many as 12 separate holes spaced 7 ft 6 in. apart. Directly below this—40 ft above the water—was the 90-ft by 24-ft cellar deck.




Offshore structures are laid out in this manner to provide the greatest degree of safety for working personnel. Prevailing winds in this area are southerly; hence the odds are greatest that, in the event of a blowout or other oil fire, the flames would be blown away from the living spaces.

In one respect, platform "E" differed from other platforms in the Block 45 field, for it was the junction of a pipeline network serving five other structures. From "E" platform a trunk line carried a daily production of 5,000 bbl of oil to the mainland.

On October 15, 1958, platform "E" was producing 1,530 bbl of oil and 950,000 cu ft of gas from 19 tubing strings in its seven wells. All were multiple producers; and one of them, "E-7," was a quadruple-pay well similar to the "world's first," described in the September issue of WORLD PETROLEUM in an article by Continental's district engineer W. W. Poimbeouf and production engineer Robert Henderson.

Indeed, Henderson was supervising the testing of this quadruple completion on the day in question and had left the cellar deck of the platform only a short time before a roar of flames engulfed the massive structure and reduced it, within a few hours, to a crumbled, molten mass of steel, leaving seven men dead or missing and injuring nearly a score.

Just what caused this holocaust has not yet been determined by a Coast Guard board of investigation or by company officials who made their own independent and exhaustive probe.

"Whatever set off this fire," testified George Grafton, district production superintendent for Continental, before a Coast Guard hearing, "was fed by a continuous source of oil and gas, but where it came from I have no knowledge."

From the standpoint of wells involved, this probably was the worst fire in the history of the oil industry.

The afternoon was a relatively clear day for autumn in the Gulf of Mexico, although a 20-mile north-northeast wind had churned up what mariners describe as a "No. 3 sea." Drilling crews, production men, pumpers, cooks, and stewards were going about their routine duties.

The quadruple producer, "E-7," had been completed the day before and Roughneck A. J. Johnson of Ellinger, Texas, was on the cellar deck taking "shake outs" from "E-7Q" under Henderson's supervision, to determine the ratio of oil and water. The three other wells from that hole were

*This "layout" of the cellar deck of the ill-fated CATC platform "E" in Block 45, West Delta area, shows the relative position of the seven wells which caught fire on the afternoon of October 15. Well "E-1" was shut in while a wing valve was being changed. Well "E-7," the second quadruple-pay well to be completed in the field, was being tested. A roughneck was taking "shake-outs" from "E-7Q" to determine the ratio of oil and water, while the fluid from the three other tubing strings was flowing into the main separator on the platform. A drilling crew was preparing to spud in well "E-8," and were welding an extension of the 30-in. conductor pipe from the cellar deck to the derrick floor above. All strings in wells "E-1," "E-2," and "E-6" were shut in; other wells, shut in.*

flowing through a steel line into a separator on the main deck. Gas from the separator was vented into the atmosphere through a 2-in. line which was level with the main deck and extending outward about 40 ft from the northwest corner of the platform.

One of the three dual producers on the platform, "E-1," had sanded up during the night, and on this day had been shut in while roustabouts Joseph C. Purl and Gerald J. Crayon were changing a wing valve and high-low shutoff under the supervision of Rufus L. Evans, one of the two Continental Oil Co. pumpers assigned to the field.

Evans had personally closed the master valve on "E-1," a fact which was later verified on the witness stand by Purl who remembered that he had handed Evans a stilson wrench and watched the pumper while he gave the valve an additional turn to be sure that it had seated.

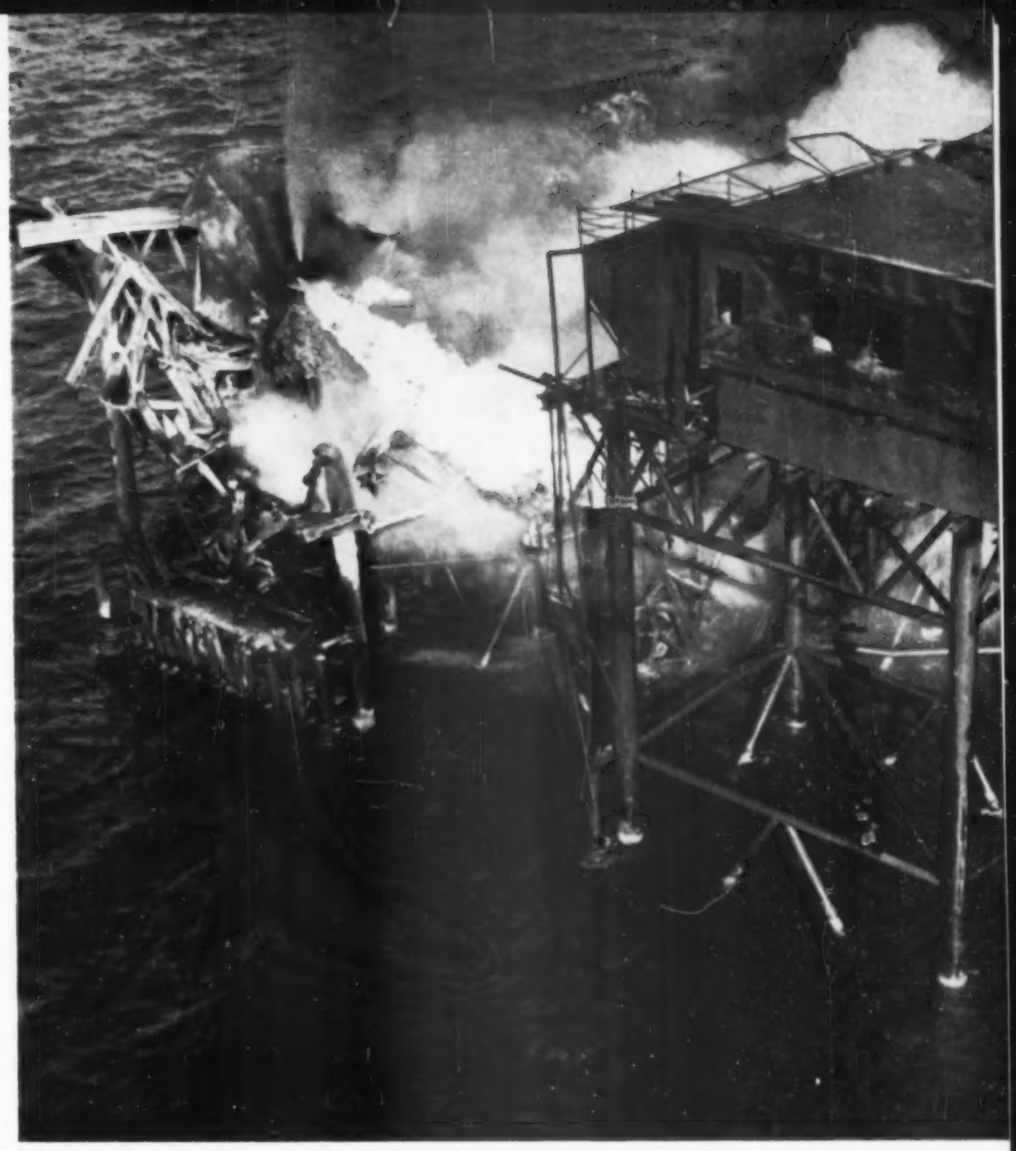
After seeing that the two roustabouts were proceeding with what ordinarily would have been a routine operation, Evans left the cellar deck and went to his room to catch up on some paper work.

Two other men were on the cellar deck. Dan Hogan, a welder for the "A-1" Boiler and Machine Works of New Orleans, and his helper, Frank deSalvo, had been sent there by Evans to hook up a 2-in. line and earlier in the afternoon had welded three elbows in a pipe extending from the main deck to the cellar. They had suspended their work, on Evans' order, so the changing of the wing valve on "E-1" could proceed with safety. DeSalvo, one of the survivors, later said that he and Hogan had not engaged in welding for an hour before the fire and were not using the welding equipment when the fire broke out.

This was the status of the 19 oil wells on platform "E":

| Well | Horizon | Condition |
|---|---|---|
| E-1 | 8374-8400 | Shut in |
| E-1D | 7960-7970 | Shut in |
| E-2 | 7462-7476 | Shut in |
| E-2D | 6682-6690 | Shut in |
| E-2T | 6320-6330 | Shut in |
| E-3 | 7348-7374 | Shut in |
| E-3D | 6818-6840 | Flowing |
| E-3T | 5760-5780 | Flowing |
| E-4 | 7351-7356 | Shut in |
| E-4D | 6775-6780 | Flowing |
| E-5 | 9384-9390 | Flowing |
| E-5D | 9082-9088 | Flowing |
| E-5T | 6508-6514 | Flowing |
| E-6 | 9091-9096 | Shut in |
| E-6D | 6517-6522 | Shut in |
| E-7 | 9106-9111 | Testing |
| E-7D | 8715-8720 | Testing |
| E-7T | 6556-6561 | Testing |
| E-tQ | 5913-5918 | Testing |

Earlier in the morning pumper Evans had shut down the entire platform for 1½ hours to clean the separator and then put it back on production in the manner listed above.



*Fire spewing from a well toward the airconditioned living quarters from which many of the survivors leaped 65 ft into the sea.*

Directly over the cellar deck, on the derrick floor, a crew of Nicklos Drilling Co., the drilling contractor, was spotting 30-in. conductor pipe in preparation for spudding well "E-8." It is the general practice to drive this 30-in. casing for each well when the platform is erected; then, as the drilling rig is moved from one location to another, the conductor pipe is extended from the cellar deck to the main deck and properly secured by studs, or angle irons, welded to the collar of the pipe.

Driller Charles E. Moseley, an oil-field veteran, was directly in charge of this work. His tour began at 10:30 am that day. The drilling crew was on the cellar deck, putting the casing extension into place. They started welding the 30-in. pipe about noon and finished the job shortly after 2 o'clock; then the crew moved to the main deck to "spot" the conductor pipe. B.J. Puryear, an experienced welder and trusted employe of Nicklos, continued with his "hot work"—taking on the necessary angle irons about 2 ft above the derrick floor. While this was taking place, Moseley and other members of the crew stood by waiting for the welder to finish his work.

Witnesses later recalled that two welding machines were running on the main deck,—one for the use of Puryear and the second for Hogan.

In the office of the platform were Ed Hilburn, senior drilling foreman for Continental Oil Co., the man in charge of operations on platform "E"; Carl Swenson, tool pusher for the drilling contractor, who was second in command; and Henderson. The remainder of the 29 men reported on platform "E" were engaged in various duties, or were asleep in their bunks or lounging about the recreation room.

Such was the activity on CATC platform "E" just before 3:45 pm., October 15, 1958.

An instant later the man-made island was a raging inferno. The initial roar of flames, described by one survivor as a "whooshing sound, like when you drop a match into a pool of gasoline," was followed by a series of explosions. So quickly did the fire consume the entire platform that men were forced to plunge into the sea from whatever side of the platform they could reach. Several men trapped in the living quarters climbed through a window,

65 ft above the water, to reach safety.

Only those who were in or near the living quarters had time to don life preservers. One man who was on the cellar deck managed to claw his way to the main deck where he found a cork life ring attached to a life raft on the corner of the platform. He pulled the ring over his legs, as he would draw on a pair of pants, and with the ring encircling his body jumped feet first into the sea.

"I remember hitting the water," he testified at the Coast Guard hearing, "but I can't remember coming up."

Coast Guard officers wondered how this man survived his fall. Many wartime victims were crewmen on torpedoed ships who were killed by the force of leaping into the sea while wearing cork life preservers.

The shock of the 50-ft dive resulted in serious injury to many of those who had survived the fire.

The two welders did not survive; nor did Johnson, the man who was taking shakeouts from "E-7Q" when the fire started. Only they might have known the cause.

Much of the investigation centered around the experience of the two men who were changing the wing valve on well "E-1." The Coast Guard hearing was recessed for two weeks until Purl and Crayon, both badly injured, could be released from the hospital to testify before the board of investigation.

Purl spent the morning at work on another platform in the field, and returned to platform "E" about midday when he was sent to the cellar deck to assist in removing the wing valve from "E-1." He handed pumper Evans a wrench and watched him close the master valve. Then he disconnected the union and took out the high-low shutoff. He removed the bolts holding the wing valve—leaving two loosened nuts, top and bottom, to hold the valve on the christmas tree until he could have help to remove it.

At that point he was joined by Crayon, who also had been working on another platform in the field and who had returned to platform "E" about 2:30 o'clock in the afternoon. They tied off the heavy wing valve to an overhead beam, removed the remaining bolts, and were lowering the valve to the deck when the area was suddenly enveloped by smoke and flame.

Crayon recalled that his back was to "E-1" and the "flame was in my face and appeared to be coming from the direction of "E-3." This was the well next to "E-1" and two of its three strings were flowing at the time. Under examination, the roustabout admitted that the fire could have been in "E-7."

Badly burned on his face, chest, and arms, Crayon crawled through the flame to the ladder leading to the boat landing. His clothing was on fire, and he dropped into the water to extinguish the blaze. Crayon was not conscious of an explosion—just a "roar of flames."

Purl was holding one end of the wing valve, standing about 3 ft from Crayon and facing him. He believes he was facing north and heard an explosion which seemed to be coming from his east. He ran away from the fire to the catwalk on the northwest corner of the cellar deck, and thence made his way to the main deck. He tried to reach the living quarters, found his path cut off by smoke and fire, and then leaped into the sea after having encircled his body with the life ring.

The other man to survive the fire on the cellar deck was deSalvo, the welders helper for "A-1" Boiler and Machine Works. DeSalvo only that day had arrived at the platform and was not familiar with the geography of the cellar deck or with the relative locations of the producing wells. He testified that he "thought the fire had started on the "last christmas tree," about 30 ft away. This would have been "E-7." When the fire started, deSalvo and Hogan, with whom he was working, ran up the nearest ladder to the main deck. Hogan fell. That is the last deSalvo saw of him. Pressed for an answer about having heard an explosion, deSalvo described the sound as "a release of pressure behind me."

What spark turned platform "E" into an inferno? What gave way on the cellar deck to provide the "continuous source of oil and gas" to feed the fire? Investigators looked in vain for the answer.

Continental Oil Co. had issued definite instructions with regard to welding near flowing wells. Company regulations require that producing wells must be shut in if it is necessary to weld in their vicinity. Supervisors in charge of platform "E" did not regard conditions as hazardous; the welding was taking place at least 16 ft from the nearest producing well. On the other hand, Charles E. Armstrong, district drilling superintendent who had issued a safety letter pertaining to welding a few months before the fatal fire, testified at the Coast Guard hearing that in his opinion all wells on platform "E" should have been shut in if any welding was to be done on the cellar deck or the derrick floor.

Quick action on the part of a charter crew boat operator, and the execution of a carefully worked out emergency rescue plan, were credited with saving many lives.

Donald Parsley of Houston is owner and skipper of the crew boat "Sportsman," under charter to the CATC group and assigned to Block 45 field. He was heading for platform "E," about three-quarters of a mile away, when he saw a small flash followed by several large ones. They appeared to be below the main deck of the platform. Parsley immediately radioed the Continental Oil Co. headquarters at Empire and, as he approached the platform, began picking up swimmers—the first about 50 ft from the blazing structure. The crewboat skipper dropped life jackets in a semicircle around the platform and then doubled back, hauling men out of the water as he retraced his course. The less seriously injured rendered first aid to those suffering from burns and more serious injuries.

Meanwhile, boats were launched from other platforms in the area. As soon as he had been relieved by other boats, Parsley headed for a nearby platform with his cargo of injured men. Without delay, an emergency rescue plan devised by the offshore operators was put into effect. CATC immediately dispatched helicopters and boats from shore, as did The California Co. and Humble Oil & Gas Co., "neighbors" in the West Delta area, and the US Coast Guard. Five helicopters and many boats worked continuously for five or six days after the fire searching for bodies of the missing.

During the late hours of the afternoon of October 15, the injured were taken to neighboring platforms from which they were transported by helicopter to New Orleans hospitals. Within less than two hours after the first blast of flames on platform "E," the first victims were being wheeled into hospital operating rooms.

Company officials did not know for several days which of the 19 wells on platform "E" were contributing to the fire. The blaze was so intense it was impossible to get close enough to the scene to ascertain which of the wells were burning. By the third day the wind had changed direction and they could see that only "E-1," "E-5," and "E-7" were burning; "E-2" was blowing salt water. On the fourth day "E-1" had quit flowing and only "E-2," "E-5," and "E-7" continued, with "E-2" continuing to spew water which had the effect of generally cooling the area.

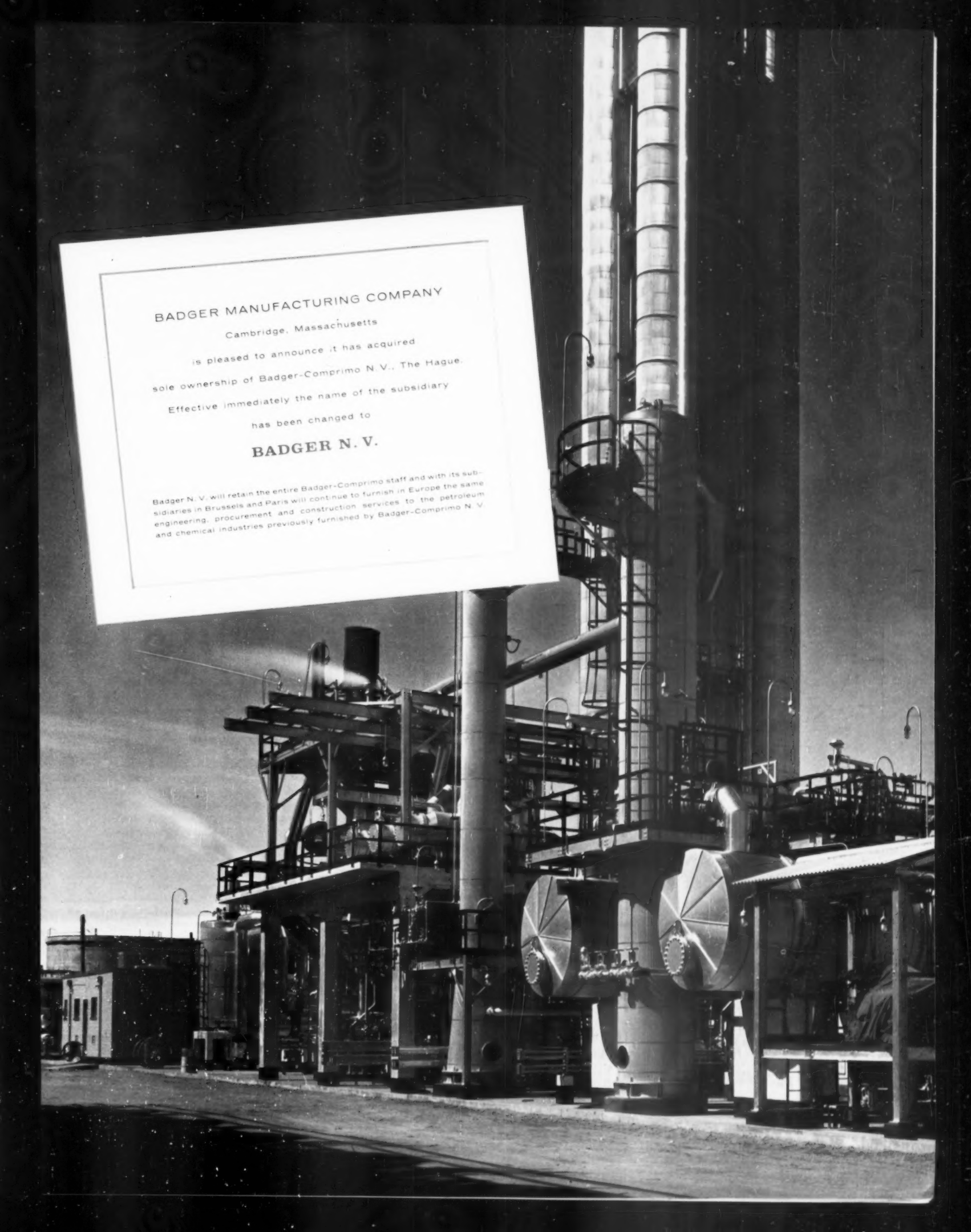
The fire-fighting organization of M.M. Kinley of Houston was summoned, and before nightfall Paul "Red" Adair, the No. 1 trouble shooter, was flying to the scene to direct operations. On the following day he rigged up an emergency fire-fighting barge and began playing water on the fire. One of CATC's big drilling tenders was towed to the scene to serve as headquarters for the fire fighters.

On several occasions the burning wells were accidentally extinguished and had to be rekindled with roman candles to prevent oil from flowing on the surface of the gulf.

Meanwhile, a decision was made to drill relief wells to the producing sands of the two wells still out of control—"E-5" and "E-7"—in an effort to kill the wild wells by flooding the sands with water and heavy mud. Three mobile drilling units were quickly dispatched to the area. The self-elevating mobile barge "Mr. Gus II," already under charter to CATC, was sent from Eugene Island. The three-legged mobile unit "Vinegarroon," second of the tripod-type LeTourneau rigs to be built for Zapata Offshore Co., and the submersible drilling barge Kermac Rig No. 46 belonging to Kerr-McGee Oil Industries Inc., were found "between jobs" and sent from the Vermillion area.

"Vinegarroon" and "Mr. Gus II" were spotted over the wells in "E-t," the former drilling to 6,800 ft to reach the upper formations, and the latter to 9,200 ft to the lower formations. Kermac Rig No. 46 drilled to 9,500 ft to the bottom hole of "E-5."

This is an established technique, first used in the 1930's to kill a wild oil well in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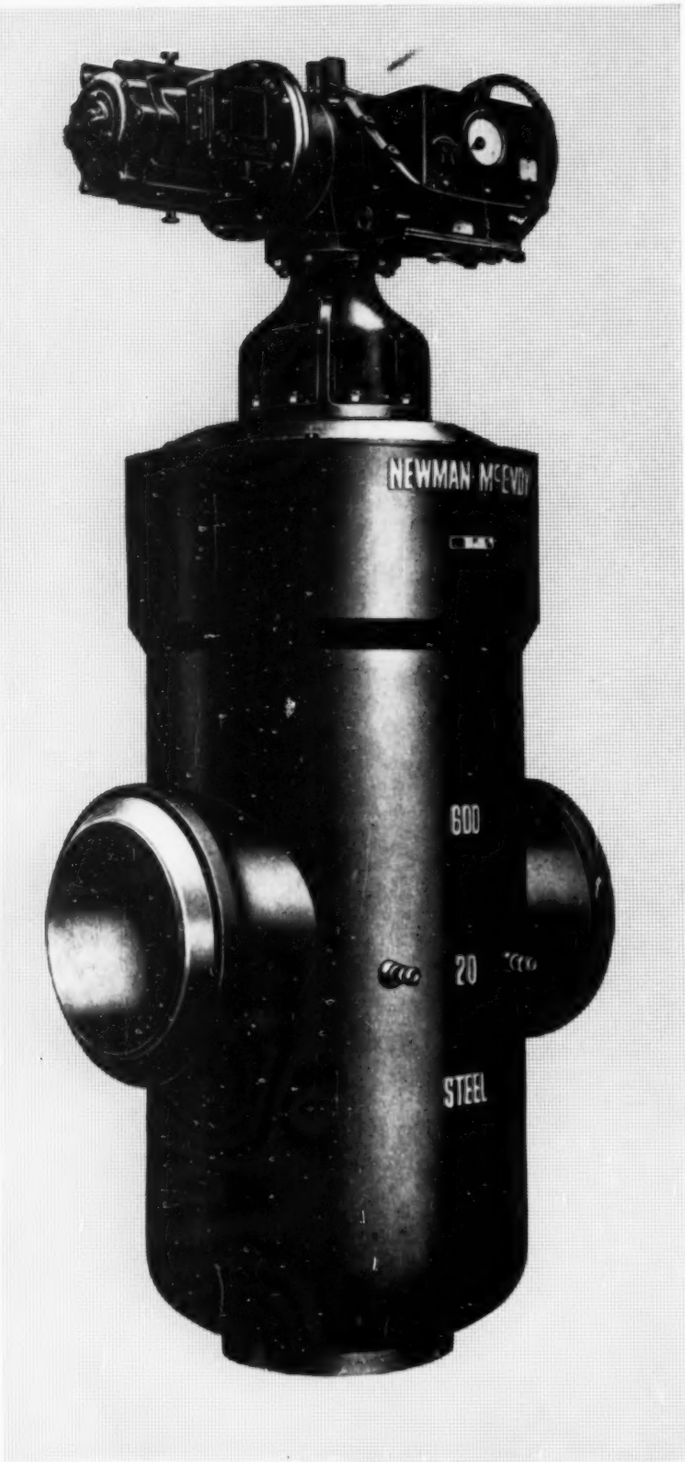


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Texas. Relief wells were drilled to the subterranean sands of the directional wells from platform "E." After reaching the desired depth and setting casing, large quantities of bentonite mixed with water were injected into the sands to control gas pressure so that the surface work of capping the wells could proceed. Bentonite was used because of its weight. This chemical, mixed with water, produces a solution weighing more than 25 lb to the gallon, as compared with water's weight of 8.24 lb.

Continental officials finally announced, on November 25—nearly six weeks after the fire—that all wells had been brought under control and that the company could proceed with the orderly operation of rebuilding the platform, pulling the tubing, seeking to determine which wells could be saved and which might be hopelessly lost. In their preliminary investigation following the control of the wild wells, it was determined that wells "E-3" and "E-6" were likely not damaged at all and could be cleaned out and restored to production.

"Vinegarroon" and "Mr. Gus II" were moved to new locations after successfully flooding the upper and lower zones of well "E-7." The third drilling barge remained on location to complete "E-5" through the relief opening.

A preliminary estimate of damage set the property loss and the cost of extinguishing the blaze at between $6 million and $8 million, exclusive of the loss of production. Since platform "E" was a junction of the pipeline network from five other platforms in the field, the total production—about 5,000 b/d—was shut down for the month, requiring relaying pipeline and erecting a production platform. Oil from the surrounding structures was collected through 6-in. and 8-in. submarine pipelines which converged into a 10½-in. trunk line terminating on Pelican Island, near the Empire jetties, where it was sold to Interstate Pipeline Co.

One immediate effect of the fire was the order to install storm chokes in all wells in the West Delta area, in spite of previous permission granted by the Louisiana Department of Conservation, to elimate these emergency devices from wells in that particular sector.

The storm choke is required in most areas where oil and gas wells are produced at sea or in other waterways. While many land areas, particularly townsites, also require storm chokes, the use of this device is virtually a "must" in marine operations. High waves, carelessly operated vessels, or drifting debris might easily snap off a christmas tree to allow the well to be turned completely loose to the atmosphere. The storm choke, set in the tubing string below the surface and actuated by a differential in pressure, is designed to automatically shut off an open well.

The storm choke most frequently used is a device manufactured by Otis Engineering Co., of Dallas, Texas, which is primarily a spring-loaded valve onto which is attached a flow bean. A coiled spring mounted in the valve cage holds the valve in an open position against the upward thrust of the pressure. Otis engineers knowing the gas-oil ratio, the amount of desired production, and the potential if the well were open to the atmosphere, preset the spring compression. If surface connections fail and the upward force of the pressure exceeds this preset compression, the valve automatically closes. The storm choke is set in the tubing string below the paraffin and swabbing line, usually at 4,000 ft to 5,000 ft.

However, in the West Delta area—and particularly in Block 45—sanding has been a very troublesome problem. The producing sands prevalent throughout Louisiana and extending seaward into the Gulf of Mexico are Miocenes. The sand is extremely fine, almost of the consistency of silt, and has very little cementation. As a result, sand is carried upward with the oil flow so that it is constantly necessary to clean separators, tanks, and other equipment. The abrasive effect of the sand also has a tendency to cut out valves, making it necessary to change them frequently.

Because any obstruction in the tubing results in more rapid sanding and prevents a clear flow of oil, CATC and other operators in the area had applied to the Department of Conservation to eliminate the storm chokes. There were none in the wells on platform "E."

Whether storm chokes would have prevented the platform "E" fire is, of course, a matter of conjecture. The quadruple producer, "E-7," would not have had storm chokes in any event at the time of the fire, since this well was still in the process of being completed. Shortly after the fire, however, CATC ordered installation of storm chokes in all of its West Deta area wells.

"It will be difficult," said one CATC official, "but we'll have to live with storm chokes."

Apparently other operators felt the same way. During the first week after the CATC fire, Otis Engineering Co. had received orders for 200 storm-choke installations.

While oil men felt the need for better "downhole" control in offshore wells off the Louisiana coast, Otis engineers believe that two types of safety valves now being manufactured may be the answer to the problem. One is the type ST Otis safety valve, intended for use in wells located in open waters or navigable channels, which can be closed, opened, or adjusted from the surface; installed or removed by wireline equipment, and repaired in the field. This valve is so devised that it will be closed by a surface control unit if the christmas tree is sheared off or damaged. The bore of the valve is much larger than that of the conventional storm choke, permitting a greater flow of oil.

Another device, also manufactured by Otis, is a ball-type subsurface safety valve which can be installed in the tubing string at or near the level of the ocean floor. Hydraulic controls automatically close the valve if well-head pressure falls below predetermined limits.

As an aftermath of the CATC fire the entire offshore industry is giving careful consideration to possible operational changes which may affect the economies of offshore oil prospecting. Such factors as the possible limiting of the number of wells to be drilled on a single platform, or the imposition of new and drastic safety regulations, either voluntarily or by law, may seriously impair the development of the offshore fields.

The US Coast Guard has jurisdiction over "artificial islands and fixed structures on the outer continental shelf" with respect to safety equipment and other matters relating to the promotion of safety of life and property. Regulations as set forth in the *Federal Register* govern the maintenance of fire-fighting and life-saving equipment, emergency means of escape, the regular conduct of emergency drills, posting of station bills setting up the special duties and assignments of all personnel for any emergency.

Just what new safety regulations may be recommended as a result of the Coast Guard investigation of the platform "E" fire can be determined only after the findings of the board are thoroughly studied and forwarded to the Coast Guard commandant.

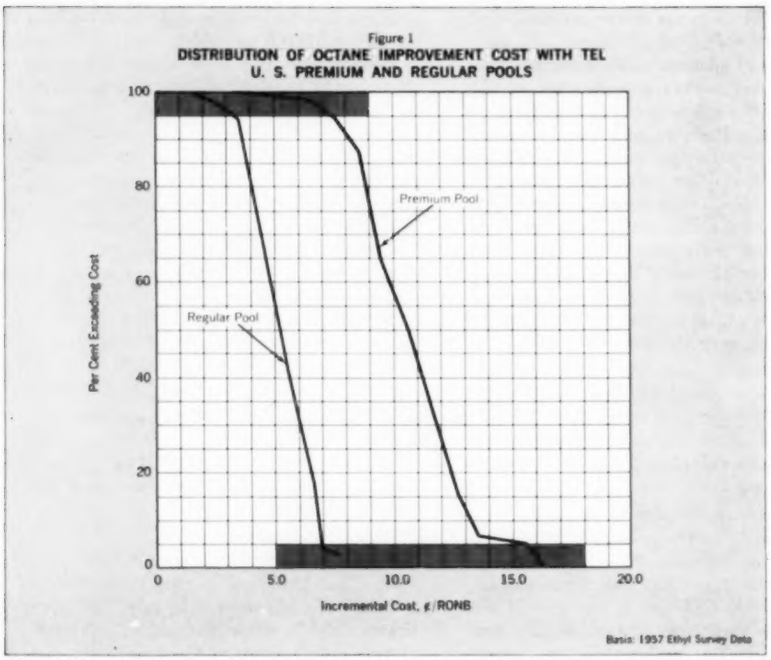
Of perhaps even greater concern to the industry as a whole is the growing attitude of underwriters that the risks involved in offshore operations are not commensurate with the premiums collected. Insurance brokers handling the bulk of the offshore business are convinced that rates will be increased by 50% to 100% in order to pay the underwriters a 10% to 15% profit and at the same time provide an adequate catastrophe reserve. Depending upon the deductible, rates on offshore drilling barges now range from 3% to 4½%; on drilling tenders from 1.75% to 2.50%; and on offshore platforms from 2% to 4%. Normal losses, which run in the neighborhood of $10 million annually in the Gulf offshore oil fields, leave little in the "kitty" to take care of major disasters. Insurance men point to the experience of one offshore drilling contractor whose perfect safety record, over a period of four years, was wiped out by one blowout. In 15 minutes his loss was more than three times the amount of the premiums he had paid during the four years of his operation.

The representative of one London underwriter, bemoaning the losses in the offshore oil field, proposed half-jokingly that the only way for underwriters to come out ahead would be to take an override on the oil profits.

"The bankers can't lose," he grumbled. "We protect the banking investment. As far as insurance is concerned, the oil business has always been cyclical, at best. Oil men come to us for protection only until they learn the odds. Then they go into self-insurance until something new comes along. The only way we'll be able to get ahead is to gamble with them." END

# New data on economics of octane improvement

Figure 1
DISTRIBUTION OF OCTANE IMPROVEMENT COST WITH TEL
U. S. PREMIUM AND REGULAR POOLS




## Ethyl Research appraises the use of tetraethyllead in refinery gasolines; summarizes recent data

by C. J. WOLF—*Refinery Technology Division*

RESULTS of Ethyl's study of the economics of tetraethyllead in current refinery gasolines now are available to oil companies as a means of comparing octane improvement costs.

This annual statistical review by Ethyl Research Laboratories in Detroit also includes an historical picture of Fall refinery fuels for the past several years.

Data are presented nationally and for the Eastern, Midwestern, Southwestern, Rocky Mountain and Western regions.

### 1957 Sample Data Represent 80% of U. S. Crude Capacity

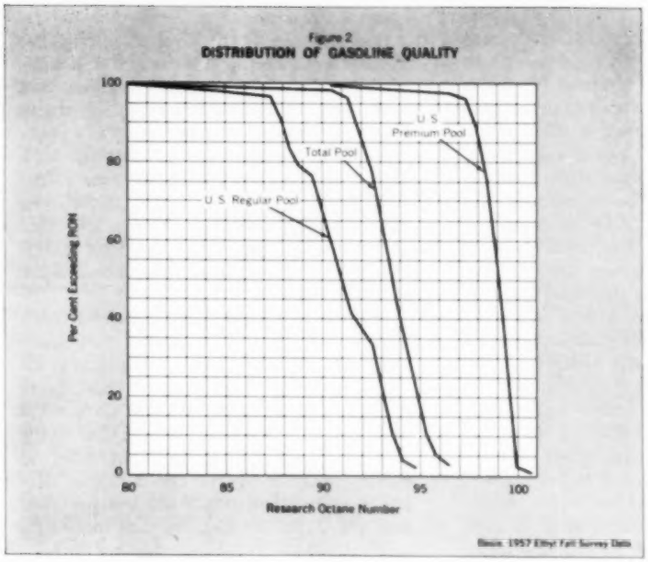
For this study, Ethyl's Fall survey of refinery gasolines was supplemented by data on additional fuel samples received by our Gasoline Testing Division from many independent refineries. Approximately 170 samples each of premium and regular fuels were processed, representing almost 80 percent of the crude running capacity in the United States.

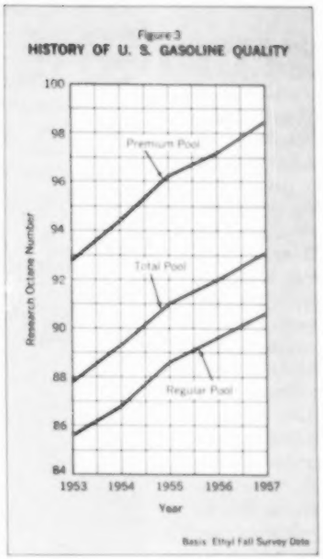
Each sample was weighted to reflect the crude running capacity of the refiner. Here are the weighted characteristics of the premium and regular gasolines and the combined pool in the United States.

| | RON | TEL Conc. ml/gal. | ¢/RONB as received | RON Gain due to 3.0 ml TEL |
|---|---|---|---|---|
| Premium | 98.4 | 2.58 | 10.10 | 0.4 |
| Regular | 90.6 | 2.18 | 4.79 | 1.4 |
| Pool | 93.2 | 2.31 | 6.50 | 1.1 |

### Octane Improvement Cost Calculations

The cost of octane improvement using tetraethyllead was determined in units of cents per Research octane




number barrel (¢/RONB). The following equation was used:

$$¢/\text{RONB} = \frac{42C\,(T+0.5)\,PN}{2800M}$$

Where

C=TEL cost, cents per milliliter
T=TEL concentration, ml/gal.
PN=performance number
M=TEL susceptibility

Tetraethyllead susceptibility data were developed for each sample from the antiknock quality on an "as received" basis and plus 2.0 ml TEL per gallon.

### TEL Costs 3.5 to 15.0 ¢/RONB

Octane improvement costs using tetraethyllead are shown by the distribution curves in Figure 1. If the terminal five percent portions of the curves (shown as shaded) are not considered, the range of incremental costs is from 7.5 to 15.0 ¢/RONB for premium gasolines and 3.5 to 7.0¢/RONB for regular gasolines.

Current data indicate the costs of octane improvement by processes such as isomerization and aromatic extraction, or by increasing reformer severity, range from 12.0 to 20.0 ¢/RONB. It would follow then that these processes are economically justified for the production of premium gasolines but not for regular gasolines.

### Trends in Gasoline Quality

Data from the years 1953 to 1957 show the significant increase in the antiknock quality of U.S. gasolines since 1953, but a lower rate of increase since 1955.

Other comparative data give the year by year trends on tetraethyllead concentration, possible gain in Research octane number due to 3.0 ml of tetraethyllead per gallon, tetraethyllead susceptibility, octane improvement costs, and sensitivity.


## How Ethyl Research is helping you

Since 1953 Ethyl Research has made an annual appraisal of the economic status of tetraethyllead as a means of octane improvement. Data from these studies have been used as a statistical reference on refinery gasolines for both current and historical review.

Widespread interest has prompted Ethyl Corporation to summarize these data (1953-57) for the Petroleum Industry in report form.

Copies of the report, entitled "Economics of Tetraethyllead in Refinery Gasolines," are available from your Ethyl Representative or by writing Ethyl Corporation, 100 Park Avenue, New York 17, N. Y.

Further, if you would like to discuss octane improvement costs with one of our Refinery Technologists, your Ethyl Representative will be glad to arrange a meeting.

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## The UK—
## A Heavy-Oil Economy

*(Continued from page 37)*

and 14 constructing or on order. When all are completed, their total capacity will be 120 mmcf per day. Gasification plants alone will save 1 mm tons of coal a year and consume 400,000 tons of oil.

A factor of considerable potential importance will start in the near future with the arrival from Texas of the first shipment of 2,000 tons of liquefied natural gas for use in town-gas supply. The Gas Council chairman has said that a 30,000-ton tanker could in a year transport the equivalent of gas from 2 mm tons of coal.

*Consumption Trends:* Total oil deliveries into consumption show a monthly average of 2,228,500 tons over the first nine months of 1958. This compares with the full year 1957 and 1956 averages of 1,858,600 tons and 1,922,200 tons, respectively, but direct comparison is meaningless through the effects of the Suez Canal blockade. Some indications of individual product changes are shown in Table III.

Table III

UK Consumption of Petroleum Products

| | *Monthly Average (1,000 Tons)* | | |
|---|---|---|---|
| | *Year 1956* | *Year 1957* | *Jan.-Sept. 1958* |
| Motor Spirit | 527.0 | 478.7 | 557.6 |
| Difference preceding year | +1.3% | −10.1% | +16.5% |
| Kerosine—burning oil | 69.2 | 66.3 | 81.0 |
| Diesel-engine road fuel | 149.8 | 149.6 | 168.2 |
| Other gas-diesel oils | 199.0 | 195.1 | 239.8 |
| Fuel oil (excl. refinery fuel) | 539.2 | 577.6 | 807.9 |
| Difference preceding year | +20.2% | +7.1% | +39.4% |

Total deliveries into consumption for 1958 (including refinery fuel) is likely to be about 30 mm tons, comparing with 24.7 mm in 1957 and 25.2 mm in 1956. On this basis, the average annual rise over 1956-58 would be over 9%.

The accentuated trend to a "heavy oil" economy is very apparent from Table III. Notwithstanding the year's decline in steel production, it has continued to use more oil. Monthly average 1958 (January to August) was 142,900 tons against 135,000 tons through 1957, and already there are believed to be signs of revival in steel manufacture. Light fuel oil should benefit from the current drive by distributors to encourage domestic oil heating. This year burning-oil consumption by portable space heaters is expected by a leading distributor to top the million-ton mark for the first time: It estimates there are 9 mm heaters in Britain at present. The outstanding rise in fuel-oil use, however, is in public electricity generation, where average deliveries over the first eight months of 1958, at 164,300 tons, show a 210% rise over the year 1957.

Petrol consumption (allowing for the "Suez" period) presents a picture of continued increase in demand. Thus third-quarter 1958 deliveries were 8.2% higher than in the same 1957 quarter. The proportion of "premier" to "standard" grade continues to rise steadily, and the former now represents about 60% of the total.

*Solus Stations:* It is difficult to get reliable information as to progress in the practice of the "solus" or "tied" petrol station, but 1958 may have seen a further slight advance. At least it can be taken as definite that over 90% of retailers have accepted the practice. It is believed that probably 2,600 of the total of 32,000 stations are still "independent" in the sense that they have no contractual arrangement with a particular petrol company for motor-fuel supply. One major effect has been the replacement of single-pump by new multi-pump stations raising the number of pumps by perhaps 10-12% without greatly altering the number of sites. According to a recent estimate of the Motor Accessories Manufacturers Assn., there are now about 28,500 multi-pump and 3,500 single-pump sites; in 1954 the former numbered 28,300 and the latter under 5,000.

Average annual throughput at service stations has also been estimated at 45,000 gal, and per-pump at 12-15,000 gal; while the number of persons in the retail sale of petrol now probably exceeds 210,000 against 135,000 in 1948.

Wholesaling companies increased the number of directly-owned stations in 1958, and the total is estimated to be nearing 2,000, nearly 7% of the total. Including stations in which petrol-company interest is believed to be predominant, the proportion may be up to 10-12%.

Even before the government's recent removal of all hire purchase controls on motor vehicles, the Ministry of Transport estimated the rate of registration growth at 8% per annum. Total registration of all vehicles in May 1958 was 7.4 mm, of which private cars represented 4.4 mm, and as 1958 closed, with all hire purchase controls removed, the rate of registrations was likely to quicken. Business in motor vehicles is running at record rates for a period normally of seasonal decline, and this state is expected to continue. The net effect is that estimates of motor-fuel consumption are likely to need revision upwards, as are some other such oil estimates.

*Petrochemicals:* In no field of oil-industry enterprise has the advance been so striking as in the petrochemical field. UK output has so advanced that it now accounts for 35% to 40% of the western European total. The full effect in output will not be apparent until 1959 and 1960, but already there is statistical evidence of great progress. From a relatively small total output (organic and inorganic) of 55,000 tons of petrochemicals in 1950, the rise is estimated to have been as follows: 1952, 184,000 tons; 1954, 328,000 tons; 1956, 442,000 tons; and 1957, 584,000 tons. A leading authority has put 1958 output as high as 900,000 tons, of which 170,000 tons will be plastics, and a considerable increase is expected in 1959. Capital investment in the industry is estimated to have been doubled over the past two years—to about £100 mm.

One measure of the level of activity has become available in 1958 for the first time. This is the monthly total refinery output of feed stock for petroleum-chemical plants. Using monthly average deliveries as a yardstick, progress has been as follows: 1953, 42,300 tons (=100); 1954, 50,600 tons (120); 1955, 47,200 tons (112); 1956, 55,500 tons (131); 1957, 66,100 tons (156); and 1958 (January-September), 72,500 tons (171). The peak monthly figure to date was 88,600 tons last June.

Projects completed and planned have been so numerous and varied that space considerations alone prevent mention of all but very few. Pride of place must go to International Synthetic Rubber Co.'s £7-8 mm plant at Hythe based on a special 40,000 tons per year butadiene plant built at Fawley by Esso. Special GR-S rubber output is reported at the 50,000 ton per year rate and it has been stated that this could probably be increased considerably without significant capital expansion. A saving of $25 mm a year on USA purchases is claimed, and additional benefit will come from an export surplus. Esso has also arranged to supply ethylene gas to Union Carbide's £3 mm plant to be built alongside Fawley to produce 20,000 tons a year of ethylene-oxide derivatives, and to Monsanto Chemical's 10,000-ton-per-year polyethylene plant at a cost of £8.5 mm. A 25,000 ton per year ethylene-oxide plant is also planned by Shell Chemicals for Partington.

Grangemouth continues to expand in diversity of production and in value of total output, and British Hydrocarbon Chemicals has several important projects in hand. The most important of these is the addition of a third ethylene plant, largest of its kind outside the USA and more than doubling existing capacity.

Yet another oil-based chemical industry center is to be established by Imperial Chemical Industries. This will be at Avonmouth Bristol) and £100 mm is to be spent by 1970. Even so, the company still plans a further £20 mm investment in the near future on its original center at Wilton, where £70 mm has already been spent.

Ample evidence has been given to indicate the high level of oil-industry activity in all directions and the likelihood of its continuation. As the year closed, every effort was being made to swing UK economy into all-out expansion, aided by cheaper money. The £ is riding high, the bank rate has been cut five times in a year, and gold reserves have been rising for 13 months and, at £1,133 mm, stand at the highest for seven years. Despite the current minor recession, UK economy is clearly buoyant. But a mounting shadow due to mounting coal stocks must be watched carefully. Progress in oil utilization must not be bought too dearly and to the national detriment.

END

# Canada expects 10% rise in 1959 domestic crude production

by Leslie O. Rowland, Editor *Oil in Canada*

CANADIAN crude production dropped in 1958 for the first time since Leduc. The decline of 10.5% to about 163 million barrels was largely caused by loss of Pacific Coast markets. For 1959, the industry is cautiously optimistic. Estimates are that crude output again may rise to the 1957 level of about 500,000 b/d.

Alberta output in 1959 is estimated at 111 million barrels, down 27 million or nearly 20% from 1957. Exports of about 12.5 million barrels were down nearly 28 million from 1957.

While Alberta was taking the full impact of the shutoff of West Coast exports, Saskatchewan and Manitoba were pushing their surplus crude into District II at a substantially increased rate. An estimated gain of nearly 4,500,000 bbl raised their exports to 18,600,000 from 14,200,000 bbl largely due to their superior geographic position, 600 pipeline miles closer to the Minnesota and Wisconsin refineries, but also due to the presence in Saskatchewan of the southwestern medium-gravity fields on which one major refinery in St. Paul depends for its exclusive supply.

Canada's net export market loss of some 23½ million barrels was not caused by the USA import quota system. Economic conditions which caused the fall in West Coast markets anticipated the District V quotas by several months, while in District II the quotas were established with at least partial reference to the isolation of this region from domestic supply sources and provided a comfortable cushion above the econmic market. The recession affected District II by slowing its usual growth rate.

Thanks to this bulge in exports, and to substitutional use of Saskatchewan crude by Ontario refineries, displacing former Alberta supply, Saskatchewan 1958 production is estimated at 44,600,000 bbl, up 7.8 million barrels or 21% over its 1957 total of 36,800,000 bbl. Manitoba's production was almost the same as in 1957, at an estimated 6 million barrels; and the rest of Canada, comprising New Brunswick, Ontario, British Columbia, and Yukon Territory, was rounded off at 1,500,000 bbl, also about the same as the previous year.

Production of crude for domestic refinery runs is calculated at 132 million barrels, a gain of 4 million over the 1957. The principal factor was a substantial diversion of refining operations from Montreal East to Ontario refineries at both Sarnia and Toronto which use almost exclusively domestic crude.

The total export market for crude and products is estimated at just over 31 million barrels, marking a decline of nearly 23½ million or over 40% from the 1957 high level of 54.4 million barrels.

Barring an unexpected reversal of world economic conditions in oil movement and tanker rates in 1959, it appears likely that Canadian crude will continue to be noncompetitive in Pacific Coast markets. The recommendations of the Carson committee on USA oil imports indicate that a fairly stiff policy will be adopted in respect of District II, even in the case of medium-gravity crude, so that little if any increase is in sight for this region. Any rise in medium crude demand may be matched by a moderate decline in the use of Canadian light crude.

Thus a further reduction in exports is probable in 1959, but the domestic crude outlook is for a substantial increase of 10% or more, divided about equally between generally higher demand in all regions and a further diversion of refinery runs from Quebec to Ontario.

Drilling activity in 1958 accounted for 2,550 completions, off 14% from the 2,963 wells put down in 1957. Alberta completions increased moderately while Saskatchewan activity was reduced drastically.

The estimated total for Alberta was 1,600 wells, a gain of more than 13% over the 1957 total of 1,417 wells. Saskatchewan, however, had only 800 completions, down 35% from its 1957 count of 1,231 wells. Manitoba had an abrupt slump of more than 63% to 85 from 224 completions. British Columbia and Northwest Territories completions numbered 75, down 18% from the previous year's 91 wells.

Offset obligations and government pushing of crown reserve leases to help boost diminishing royalty revenues contributed to maintaining development completions at a high level. Development wells are estimated at 2,000, down only 11% from the 2,239 completions of 1957; but wildcats totaled only 550, a decline of 24% from the total of 724 in 1957.

Actually, the development wells completed in 1958 probably provided more additions to producibility than those in 1957, because there has been a steady trend to wider spacing, with 80-acre spacing a minimum now in most new fields and 160-acre spacing becoming increasingly common. This factor, combined with the relatively small prospective increase in oil markets and a poor outlook for gas export in 1959, is expected to keep the following year's completions down to about the same level as in 1958, with a total of perhaps 2,600 wells, divided by provinces in much the same proportions.

Greater average depth of wells was a mitigating feature of the 1958 decline, increasing average footage to such an extent that the estimated 1958 total was off only 5% at 13.1 million feet, compared to 13.8 million feet in 1957. With the foothills region drilling increasing steadily, involving much greater depths, and with the ratio of Alberta wells increasing over the shallower Saskatchewan completions, it is likely that 1959 will see total footage up to 1957 again, at somewhere between 13.5 million and 14 million feet.

Geophysical exploration activity finished the year with an estimated 1,100 crew-months, down 21% from the 1957 count of 1,379 crew-months. All but a negligible amount of the work was seismograph, with a small proportion of gravitymeter and no magnetometer operation.

The declining trend in comparison to 1957 was checked as the fall and winter season came on, but was still severe; and in November, the latest month of record, activity was still 18% under the November 1957 figure. The outlook for 1959 is encouraging. It is reasonable to count on about 1,000 crew-months in 1959, a reduction of only 9% from 1958, or less than half the rate of decline which occurred last year.

Natural gas had its best year for production in 1958, as the first full year of operation of the Westcoast Transmission main pipeline to the Pacific Coast and a large export market added about 70 billion cubic feet to the total production. This amounted to an increase of almost 25% over total 1957 production. The full year's production in 1958 was estimated at 400 billion, compared to 286 billion cubic feet in 1957, and out of this total there was approximately 350 billion cubic feet actually sold, compared to 220 billion in 1957.

With the Trans-Canada main natural-gas line in full operation during November, and expected to peak at 264 million cubic feet per day in 1959, the outlook for 1959 is for an increase of gas production to at least 500 billion cubic feet, of which better than 470 billion should be sold. Contributing materially to the salvaging of a great deal of previously flared gas in Alberta will be the newly operating pipeline carrying casinghead gas from the Pembina oil field to the city of Edmonton, at the rate of 50 million cubic feet per day.

In Saskatchewan a major contribution to

(Continued on page 54)

# CANADIAN NOTES

### Canada's Big 1958 Strike

Gas and oil discovery in Devonian reef formation 30 miles northwest of big Berland River gas well is believed best oil strike of 1958. Shell-Petrol-Explorers Simonette wildcat flowed 400 b/d of 47-gravity crude and 3.2 mmcf per day of gas from combined gross.

Significant gas discovery in Viking sand 35 miles south of Coleville-Smiley gas field in west-central Saskatchewan is Imperial Bayhurst wildcat which flowed 6.2 mmcf per day on drill-stem test. As location is only 30 miles from provincial pipeline grid and gas is in short supply, early market is assured, if substantial field develops.

### Larkin Opens Edmonton Warehouse

Larkin Packer Co. has opened a new warehouse in Edmonton, Alberta. The new facility began operation early in December.

Larkin's warehousing and sales activities in Canada will be operated as a separate Canadian subsidiary wholly owned by the parent company. The subsidiary will do business under the name of Larkin Products Ltd. Representing Larkin Products Ltd. as sales representatives in Canada are Lloyd Helmer in Calgary and Don Wilson in Edmonton.

### Hits Canadian Regulation

Hitting excessive federal controls recommended by Gordon commission, Imperial Oil's president J. R. White recommends national energy board to serve Canadian government in advisory capacity.

### Yukon To Have Refinery

Alaska-Yukon Refiners and Distributors Ltd. has launched $1 million construction project at Haines Junction in the Yukon Territory for 3,000 b/d plant.

### Joins Calgary & Edmonton

A. J. Beveridge has joined the exploration staff of The Calgary & Edmonton Corp., Calgary. The exploration staff of the company now consists of F. L. Croteau, exploration manager; W. A. Loucks, A. L. Evans, A. J. Beveridge, geologists; and W. B. Hartley, landman. In addition, a further geologist, Paul Jackson, joined the staff early in January 1959.

### Canada's Geology

Dr. William C. Gussow, Calgary, research geologist for Union Oil Co. of California, has received appointment to the National Advisory Committee on Research in the Geological Sciences to assist in mapping and interpretation of Canada's geology. Five other Canadian geologists also were selected for this purpose.

### Alberta Underground Storage

Alberta Underground Storage Ltd. has been formed to operate LPG storage facilities in eastern Alberta near Hughenden. Wells are being drilled to start flushing out salt-bed caverns under farmout of leases from Canadian Pacific Railway; initial facilities to be two caverns with 150,000 bbl total capacity, ultimate maximum 14 caverns with 1,500,000 bbl capacity. Ownership is Canadian Hydrocarbons, British American Oil, and Goliad Ltd.

### Yukon Exploration

Canadian Husky and Canadian Superior Oil of California have received authorization for joint $8 million exploration in the Yukon, with drilling to begin in 1960.

### Trans-Canada Takes More Gas

Deliveries of gas to Trans-Canada pipeline have started from two major Alberta fields: Pincher Creek at 100 mmcf per day, and Cessford at initial 100 mmcf to level off at 90 mmcf. With inclusion of minor fields now under contract, Trans-Canada's first season operation may be using close to 250 mmcf per day, nearly half capacity.

*John Stuart, area automotive superintendent for Shell Oil Co. of Canada Ltd., states that ability of the wide-tracked Nodwell transporters to perform in muskeg conditions "has now been proven." Here, drilling equipment used in Shell's first test is being moved to another location. Shell said that this was the first time a rig move had been successfully completed by overland transport through muskeg country during summer months. The operations were carried out in northern Alberta, about 20 miles from the Northwest Territories border.*

### Saskatchewan Find By Canso

An oil discovery in the west-central area of Saskatchewan has been announced by United Canso Oil & Gas Ltd. On one-hour drill-stem test of a thin zone at 2,300 ft, the well flowed estimated 33 API gravity oil at a rate of 12 bbl per hour through a ½-in. choke.

The well is located on a 2,560-acre block which lies adjacent to sizable United Canso holdings in the Hoosier gas area.

### Purchase Pembina Gas

Charles P. Smith, manager of operations of Alberta and Southern Gas Co. Ltd., has announced that Alberta and Southern had commenced the purchase of gas in the Pembina field under contracts signed last year with producers in that area. The company has purchased contracts with 78 producers. Initially, all the gas is being resold to Northwestern Utilities for use in the Edmonton area.

### Westcoast Increases Land Holdings

Optimistic over chances for approval of its gas-export plans, Westcoast Transmission Co. Ltd. has purchased land for a $15 million gas-processing plant.

### Saskatchewan Gas-Line Extension

United Canso Oil & Gas Ltd. has completed a gas pipeline extension to the North Hoosier field in west-central Saskatchewan. United Canso holds about 9,000 acres within this North Hoosier area, estimated to be productive from the Viking chert zone at a depth of approximately 2,400 ft. The new gas line includes a 6½-mile extension from two United Canso wells at North Hoosier to the main line of the Northern Saskatchewan system. The wells are to provide six million cubic feet daily to the system during peak loads.

### Alberta Gas To California

Alberta & Southern and Westcoast Transmission Co. have combined to build a $40 million line 105 miles to the USA border near Eastport, Idaho. Pacific Northwest-El Paso would hook up to distribute through their system all the way to California.

### B. C. Gas Discovery

Pacific Petroleums Ltd. has encountered gas in Triassic "D" zone in joint Pacific-Imperial-Jedney 99-J, Beatton River area of northeastern B. C.

### Interprovincial Deliveries

Interprovincial Pipe Line Co. has started deliveries of domestic crude to new refinery of Cities Service Oil Co. Ltd. in Toronto area. This will be third refinery at Toronto, where total capacity now exceeds 100,000 b/d. Refinery is due for startup early in 1959.

*(Continued from page 53)*

salvaging of formerly waste gas went into operation in October, and will be running at full capacity through 1959 also. This facility is the gas-conservation plant of Steelman Gas Ltd. in the Steelman oil field, which is processing 25 million cubic feet per day, with provision for ultimate expansion to 42 million.

Out of a total of 4,200 miles of pipelines laid in 1958, natural-gas main lines accounted for more than 1,000 miles, while laterals and city distribution systems numbered another 2,600 miles, for an impressive total of 3,600 miles, against only 600 miles of oil pipelines, including gathering systems.

The outlook for 1959 is clouded by uncertainty surrounding the future of several major gas-pipeline construction jobs which are awaiting approval from the various governmental authorities, in both Canada and the United States, with very little chance of a start on any of them during 1959. Apart from these big jobs, which will eventually add 1,000 miles or more of main lines and more than that in laterials, field gathering systems, and distribution systems, the bulk of the 1959 construction is shaping up as local system construction, mainly in Saskatchewan, Ontario, and Quebec—with some in Alberta—and the building of a few more oil-gathering systems. The whole total looks like about 2,500 to 3,000 miles, with much smaller average diameter, as literally no big-inch construction is on the books except for some 24-in. work on the Alberta Gas Trunk system.

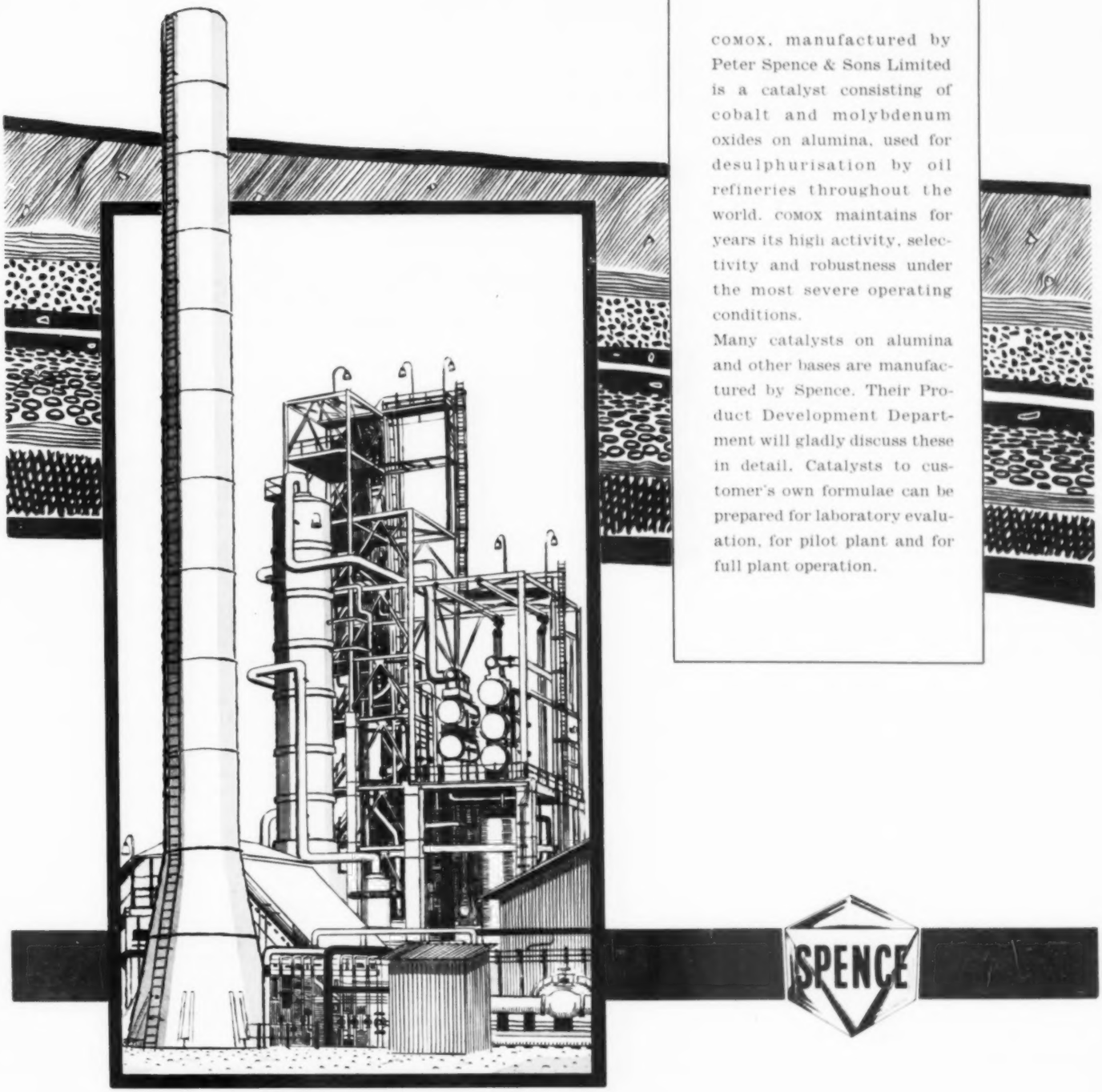
One of the main construction jobs of 1959 will be the further expansion of the local network of Saskatchewan Power Corp., which is estimated at more than 500 miles, more total mileage than its banner construction year of 1958 but in smaller diameters, adding nearly one-third to its total system mileage.

The refining phase of Canadian operations is due for a little revival in 1959, after a thorough shake-out of troublesome economic conditions in 1958. Due to the heavy overstock position at the beginning of 1958, refinery runs were reduced drastically to an estimated 225 million barrels, from 240 million in 1957. The entire reduction was accomplished at the expense of imported crude, which was down to an estimated 93 million barrels from 111 million in 1957; while domestic crude, as mentioned before, was used to the extent of 132 million barrels, an increase of some 4 million.

As products were withdrawn from built-up stocks to satisfy part of the product demand, this item was larger than in 1957, at an estimated 260 million barrels, of which 20 million were imported, and 15 million taken from stocks, compared to 251 million in 1957 with 240 million run during the year and 25 million imported, keeping runs and imports combined up to 14 million over the actual market. The increase of more than 3% in total demand in 1958 compared extremely well with other major petroleum consuming nations, and indicated an excellent prospect for an increase of up to 7% to 8% in 1959, barring a major depression.

END

# Top grade petroleum products



COMOX, manufactured by Peter Spence & Sons Limited is a catalyst consisting of cobalt and molybdenum oxides on alumina, used for desulphurisation by oil refineries throughout the world. COMOX maintains for years its high activity, selectivity and robustness under the most severe operating conditions.

Many catalysts on alumina and other bases are manufactured by Spence. Their Product Development Department will gladly discuss these in detail. Catalysts to customer's own formulae can be prepared for laboratory evaluation, for pilot plant and for full plant operation.

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*The Coliseum, New York, where representatives of 30 nations will participate in proceedings of the Fifth World Petroleum Congress, May 30 through June 5, 1959.*

# 30 nations to present papers at World Petroleum Congress

Oil scientists and technologists in 30 countries are now preparing approximately 285 papers for presentation at the Fifth World Petroleum Congress in New York's Coliseum next May 30 to June 5.

While the technical program for the meeting is now substantially firm, there is much detailed planning still to be done by the congress secretariat in New York. Progress reports on this will be put before the Permanent Council, the policy-making group of the congress, meeting in Brussels in January. Representatives from technical societies or professional groups in 12 countries make up the council.

In the meantime, the preliminary program has been issued to potential registrants both in the USA and abroad. With this program have been distributed the tentative list of papers to be presented, a brochure outlining 12 industrial tours being organized in conjunction with the congress, a list of the hotels in mid-Manhattan in which blocks of rooms have been provisionally reserved for congress registrants, a program of entertainment for wives accompanying registrants, and registration forms.

It is expected that between 5,000 and 6,000 oil men from 50 countries will be participating in the 100 technical sessions to be held the week of the congress.

The technical program has been divided into 10 sections which will cover all phases of the petroleum industry's activities from the search for oil right through to its delivery as refined products. The program will not, however, be directly concerned with the commercial end of the oil business.

Although atomic energy contributes little as yet to the enormous, rapidly growing energy requirements of the world, and it is unlikely it will for some time, the petroleum industry has been quick to see the possibilities of using nuclear energy to solve many of its problems, particularly those encountered in exploration, production, and refining.

Considerable nuclear research is being carried out by petroleum scientists; and the great importance of this work is reflected in the fact that this year, for the first time, a section of the congress is being devoted to developments in this field. Seventeen papers from authors in Great Britain, France, Russia, and the United States will be presented.

It is proposed to open discussions with a general paper on the probable impact atomic energy will have on the petroleum industry throughout the world.

There will follow other studies, including the peaceful uses of atomic explosives such as those which may be used for underground detonations to boost oil production; the use of atomic physics in oil prospecting; the technical and economic prospects of nuclear energy in the petroleum industry; the use of radioisotopes in fuel and lubricant research; the way in which chemical reactions—vital to modern refining and petrochemical manufacture—are affected by radiation; and the lubrication requirements of nuclear power plants.

At least 14 USA oil companies have large-scale radiation programs under way or planned, and already the use of nuclear energy is bringing big returns to the petroleum industry in the United States. For instance, it has reportedly been estimated by the Atomic Energy Commission that oil refiners have saved $5 million to $10 million in a year through the use of radioisotopes, and that radioactive tracers used in connection with oil-well stimulation have produced annual savings of as much as $120 million to $140 million.

Furthermore, the Atomic Energy Commission is reported as predicting that radioisotopes will be responsible for a saving of something like $5 billion to all USA industry by 1960. A portion of this saving should be to the oil industry. Technical progress, plus more information about radioisotopes, is leading to a wider acceptance of radiation methods.

There is almost no limit to the possible uses of radiation in processing plants and laboratories. The most popular application of nuclear energy in refining is in relation to measurements—analytical measurements in control laboratories; level, thickness, and depth measurements—most using radioisotopes.

Other typical applications now being made of radioisotopes are the detection of product interfaces in pipelines; density measurements for fluid catalyst distributing; flow measurements for mixing gases, liquids, and solids; entrainment in evaporators and distillation columns; mixing in alkylation units; determining flow rates in pipes; tracing the flow of fluid and granular catalysts; finding leaks in heat exchangers and underground pipes; measurement of tank volume; study of fluid catalyst aging, loss, and attrition; and radiographic testing of metal parts, as well as of metal welds.

Developments in methods of discovering and producing new sources of crude oil to supplement fields now being depleted are to be given major emphasis at the 1959 meeting. Eighty-six papers, nearly a third of the total number to be given at the congress, will concentrate on these subjects. Progress on the development of shale oil as an energy source will be another topic for discussion.

The geology and the results of exploration in many areas of the world are to be dis-

(*Continued on page 72*)

# HCSmith 3-CUTTER ROCK BITS

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*Storage tanks in which finished isooctyl alcohol is accumulated prior to shipment (photo courtesy Esso Standard Oil Co.).*

# Petrochemical horizons for propylene

## Part IV: *Nonene, dodecene, and oxo derivatives (contd.)*

**by Peter W. Sherwood**

*Chemical Engineer, White Plains, N.Y.*

VII—Oxo *Derivatives of Propylene and Its Polymer:*

Olefins may be converted to alcohols by the *oxo* process. The method involves reaction with synthesis gas (a mixture of carbon monoxide and hydrogen) at approximate 3,000 psi and 150 C to 175 C in the presence of a cobalt catalyst. The reaction product contains one more carbon atom than the feed olefin:

$$R\text{-}CH\text{=}CH_2 + CO + H_2 \rightarrow \begin{cases} R\text{-}\underset{\text{CHO}}{CH}\text{-}CH_3 \\ R\text{-}CH_2\text{-}CH_2\text{-}CHO \end{cases} \quad \ldots\ldots (14)$$

The *oxo* reaction made its commercial debut in the United States in 1948 (at Esso's Baton Rouge, La., refinery). Today five companies employ this method to produce various alcohols and aldehydes. USA plant capacity for *oxo* products in late 1958 is expected to be 220 million pounds per year. In addition, one producer (Amoco Chemicals Corp.) has recently announced its plans to add 50 million pounds per year to its present capcity (15 million pounds per year).

In today's commercial picture, five olefins serve as *oxo* feed stocks in signifiant measure, as shown in Table III.

**Table III—Oxo Feed Stocks**

| Feed Olefin | Oxo Derivative | Present Producers of Oxo Product |
|---|---|---|
| Propylene | Isobutyraldehyde, n-butyraldehyde, isobutyl alcohol | Tennessee Eastman |
| Butene | Amyl alcohols | Carbide & Carbon |
| Heptene | Isoctyl alcohols | Carbide & Carbon, Esso, Amoco, Gulf |
| Nonene | Decyl alcohols | Carbide & Carbon, Esso, Amoco, Gulf |
| Dodecene | Tridecyl alcohols | Carbide & Carbon, Esso, Gulf |

It will be noted that three of these raw materials belong in the field of propylene chemistry. They are propylene itself, its trimer (nonene), and its tetramer (dodecene).

An important aspect of the *oxo* reaction, which contributes heavily to its attractiveness, is its versatility which permits ready changeover from one product to another as market requirements may dictate.

The group of *oxo* products includes both aldehydes and alcohols. Actually, manufacture of aldehydes by this process must be confined to products in the $C_3$-$C_5$ range. Higher-boiling *oxo* aldehydes cannot be purified directly without excessive degradation loss. They are, therefore, hydrogenated to the more stable alcohols which may be refined by distillative means without undue difficulties.

Each of the principal *oxo* products has a different field of application which constitutes its main market. In the case of the derivatives of propylene and its polymers, five compounds (and compound mixtures) are involved. Their principal outlets may be briefly summarized as follows:

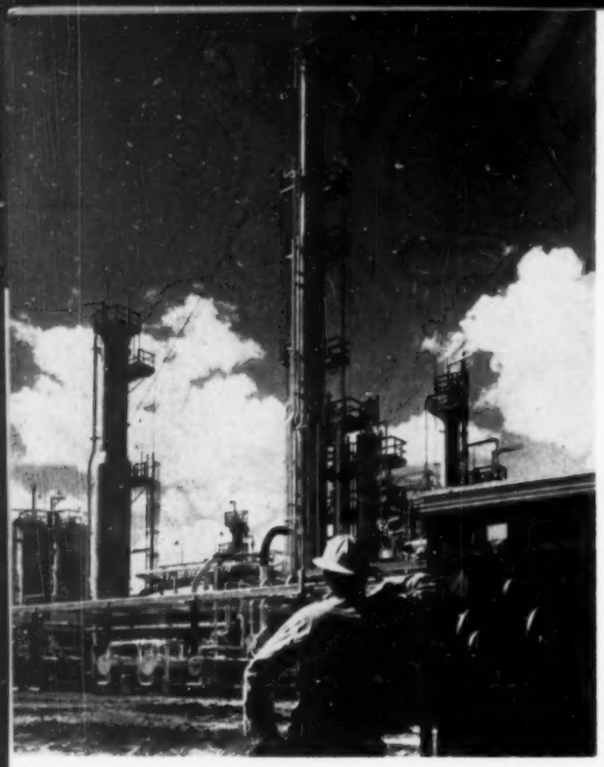
A. *Derivatives of Propylene Proper*—

1. *n-Butyraldehyde* finds important utilization as intermediate in the production of butyric acid and its anhydride. One of the most significant reactions of butyraldehyde is with polyvinyl alcohol to form polyvinyl-butyral, an interlayer in safety glass.

The self-condensation of butyraldehyde and subsequent conversion to 2-ethyl hexanol has assumed significance in the production of the plasticizers trioctyl phosphate and dioctyl phthalate; condensation of butyraldehyde with phenol yields an important class of oil-soluble resins.

In the production of n-butyraldehyde, the *oxo* process must compete with the predominant synthesis in which acetaldehyde serves as raw material.

2. *Isobutyraldehyde* is unavoidably



*Polymerization facilities, combination unit, at Mandan, N.D., refinery of Standard Oil Co. (Indiana).*

formed as coproduct of n-butyraldehyde synthesis by the *oxo* route. There are only a few relatively minor specific outlets for this aldehyde. Markets are being developed chiefly along the lines of the straight-chain isomer. Because of the limited sales potential for isobutyraldehyde, the *oxo* conversion of propylene is being conducted so as to minimize its formation. Several means are at hand toward this end which have been described by the author elsewhere[6].

3. *n-Butanol* is principally employed as solvent (for resins) and as intermediate in the manufacture of butyl acetate (a solvent), dibutyl phthalate (a plasticizer), and butylamines. *Oxo* production makes up only a minor portion of n-butanol output which is obtained primarily from acetaldehyde.

B. *Derivatives of Propylene Trimer* (Nonene)—

4. The mixture of *decyl alcohols* which is obtained by the *oxo* conversion of nonene serves principally in the production of plasticizers for polyvinyl-chloride resins. Most important of these products are the derivative phthalate esters, with adipates and sebacates in a lesser position.

This field, which constitutes the main market for *oxo* compounds as a group, is highly competitive, and the short-term growth potential for decyl alcohol is moderate, at best.

C. *Derivatives of Propylene Tetramer* (Dodecene)—

5. A mixture of tridecyl alcohols is obtained in the course of dodecene oxoation. This product finds its principal use in the manufacture of detergents and wetting agents. Other outlets include the synthesis of tridecyl mercaptan (a rubber modifier) and of tridecyl esters of 2, 4-D and 2, 4, 5-T for use as specialty herbicides.

*Technology of the* Oxo *Process:* The reaction of olefins with synthesis gas, which has come to be known as the *oxo* reaction, is commercially carried out in the liquid phase. In the oxoation proper, cobalt carbonyl is the active catalyst; it is formed *in situ*.

Where the desired product is an alcohol, the conversion is carried out in two distinct stages: formation of the aldehyde in the presence of cobalt carbonyl, followed by hydrogenation to the corresponding alcohol. While the hydrogenation may also be carried out over cobalt catalyst (but in the absence of carbon monoxide), other more efficient catalysts are available and normally used in this stage. It is, therefore, customary to provide a cobalt removal ("decobalting") step between the *oxo* converters and the hydrogenation reactors.

In the *oxo* stage proper, reaction performance is controlled by three major independent process variables: Catalyst type and concentration, operating temperature, and contact time. Another variable, recycle, is fixed by considerations of reactor design, control of isomer distribution, and the need to conserve cobalt in usable form. Finally, there are secondary variables, including $CO:H_2$ ratio (which is universally controlled near unity), and choice of solvent.

It has been demonstrated that the active catalyst principle in the *oxo* process is cobalt hydrocarbonyl. At the temperatures of the *oxo* reaction, this compound is not stable except at very high partial pressure of carbon monoxide. It is this consideration which makes it necessary to operate at a total pressure in the range of 3,000 psi.

Cobalt fed to the reactor must be in a form which is amenable to ready conversion to cobalt hydrocarbonyl. Several techniques are available to this end. Early work leaned toward the use of dispersed solid cobalt catalyst of high activity (usually Fischer-Tropsch catalyst). Current technology prefers the use of oil-soluble cobalt salts (e.g., cobalt naphthenate) which are fed to the reactor, dissolved in the olefin feed. Because of the high cost of these materials, some sort of recovery is required.

The minimum practical concentration of cobalt carbonyl in the reaction medium is 0.25% by weight, but commercial concentrations run as high as 0.8% to 1.2%. This content can be maintained at 160 C and a carbon monoxide partial pressure of 1,500 psi (corresponding to a *total* pressure slightly in excess of 3,000 psi).

From the point of view of useful conversion per pass, an optimum temperature exists which is dependent on the feed olefin. In the commercial oxoation of heptenes, operation is preferably carried out between 160 C and 175 C. Propylene is converted at 145 C to 160 C.

Between 50,000 and 62,500 Btu per lb-mole is evolved in the course of the *oxo* reaction (the exact amount depends on the feed stock). It is, therefore, necessary to provide adequate methods of heat removal so that the temperature may be held within a range of 10 C to 12 C, which constitutes the normally permissible limit.

Two approaches in converter design are taken to meet this objective. The more common method calls for the use of adiabatic reactors which are cooled by recycling part of the effluent stream via an external heat exchanger. The alternative is the use of isothermal converters provided with internal cooling tubes. Units of this type must be designed for high flow turbulence (Reynolds number should exceed 11,000) in order that the tempertaure may be adequately controlled and catalyst deposition on the tubes be avoided.

*Contact* time is adjusted to the point of optimum conversion of the olefin. At this stage, the product is predominantly aldehydic, but a portion will have been hydrogenated to alcohol. The actual time required to achieve optimum conversion of a particular feed stock depends on catalyst concentration (and, therefore, on pressure) and on operating temperature. In the oxoation of heptenes at 175 C, 2,600 to 2,900 psig, and approximately 0.3% by weight of cobalt content, the actual optimum contact time is between 10 min and 30 min. At these conditions, useful olefin conversion is between 75% and 78%.

In the *oxo* conversion of normally liquid olefins, no external solvent is supplied; the hydrocarbon itself serves as catalyst carrier and suspension medium. Laboratory work has indicated some gain in reaction rate is achieved by diluting the feed olefin with ethyl or methyl alcohol, but the benefits are insufficient to offset the economic penalties which are inherent in the use of an auxiliary solvent.

On the other hand, the conversion of normally gaseous propylene by the *oxo* reaction makes it necessary to provide an auxiliary solvent. Hydrocarbons as well as water have shown promise in this function in pilot-plant work. More recently, the emphasis has shifted to the use of lower alcohols, e.g., n-butanol as solvent in the con-

**Typical of the sort of super service station BP is building across the two provinces, this BP garage stands at the corner of Ontario and Leclaire Streets in down-town Montreal. Says 42-year-old owner WILLY SWEET (cleaning windscreen) – "It's a darn nice outfit, BP. Sales? I was up 4,000 gallons first month I took over."**

# CANDID CANADA SPEAKS ITS MIND

It was only in April last year that the first gallon of BP gasoline was sold in Canada.

Today, BP Canada Limited (an affiliate of the international British Petroleum Company Limited) operates a chain of over 350 garages, spanning across the provinces of Ontario and Quebec. Later this next year, BP will have around 700 garages. And by 1960, a great new BP Refinery will be in operation at Ville d'Anjou. Recently a special reporter was sent over from London to find out just what Canadians think of BP's great new development. What the motorists think, you can read on this page. They think BP's good. But what of the men who sell it? For this, come to the BP Don Mills service station, Toronto City. Here works expatriate Britisher Mr. W. R. Matthews. He used to sell BP in England. Now he sells it in Canada. And what does he think? "Sir," he said to the BP reporter, "the future of BP in Canada? The answer is WOW!"

Driver of a British Ford Anglia, 74-year-old SAM DIAMOND of Ottawa. "I find BP 100%. Been using it for about a month now and yes sir, I find everything about BP just fine."

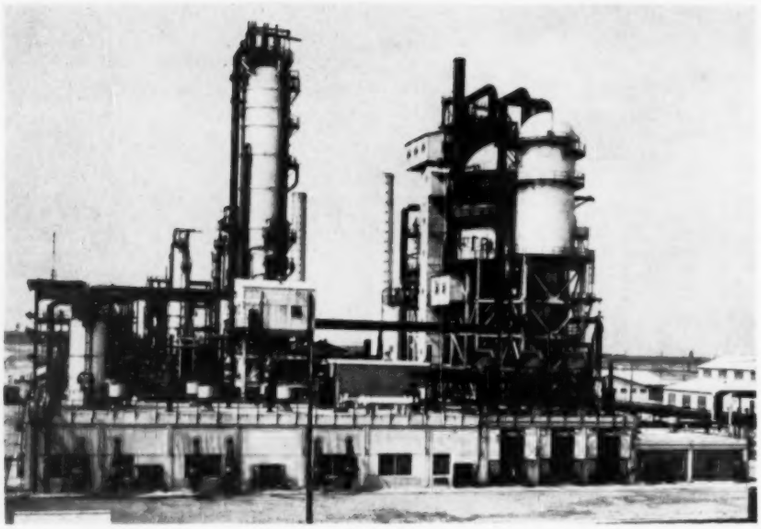
Out for a weekend trip with his wife and 7-year-old daughter Marilyn, DONALD MORRISON of 28 Greenland Road, Don Mills. "I always use BP, it sure is OK by me."

28-year-old VIC ORTIZ of 4 Hollywell Drive, Toronto City, drives Ford Fairlane 235-774, is himself in the automobile business: "It's real fine gas is BP. As for service, I reckon they give the best you'll find in the city."

Pipe Line Spread Boss, 37-year-old WILLIAM BERNARD of 74 Jackman Avenue, Toronto. "I always use BP and I find it works real good. I reckon British goods are just fine."

THE BRITISH PETROLEUM COMPANY LIMITED

BP



*FCC unit at Texaco's Eagle Point refinery, looking north at south end.*

version of propylene to butyraldehydes.

The effluent from the *oxo* reactor contains both dissolved and suspended cobalt catalyst which must be removed before further processing unless the hydrogenation reaction, too, is to be carried out in the presence of cobalt catalyst. As we have already indicated, the tendency today is to employ other and more specific catalysts for conversion of aldehydes to alcohols.

Several means are available for effective decobalting of *oxo* product. Very effective removal is reportedly achieved by washing the liquor with dilute sulfuric acid. In this approach, cobalt salt is obtained in the form of a 1% to 5% by weight of an aqueous solution and poses a problem of economic recovery.

An alternative approach to decobalting calls for mild hydrogenation of the *oxo* product at 150 C to 180 C and 100 to 175 psig. In the course of this step, contained cobalt is converted to the metallic state, and can be recovered as such by filtration.

The predominant product of the *oxo* reaction is a mixture of isomeric aldehydes. A portion (approximately 30%) of this product will have been reduced to the corresponding alcohols. In addition, there are numerous side products—including esters, ketones, acetals, and polymers.

Light aldehydes (commercially only the butyraldehydes) obtained in the *oxo* stage can be purified by distillative methods. This approach is precluded in working up higher aldehydes, since the high required still temperatures would cause excessive degradation of product. Conversion to the more stable alcohols in a secondary hydrogenation stage alleviates the purification problem and yields the line of products for which significant markets have been developed.

This conversion step to alcohols has a determining effect on the purity of the olefin stock fed to the overall process. Most particularly, the absence of sulfur compounds must be assured to prevent poisoning of the hydrogenation catalyst, while it should be noted that sulfur does not interfere with the operation of the *oxo* reaction proper.

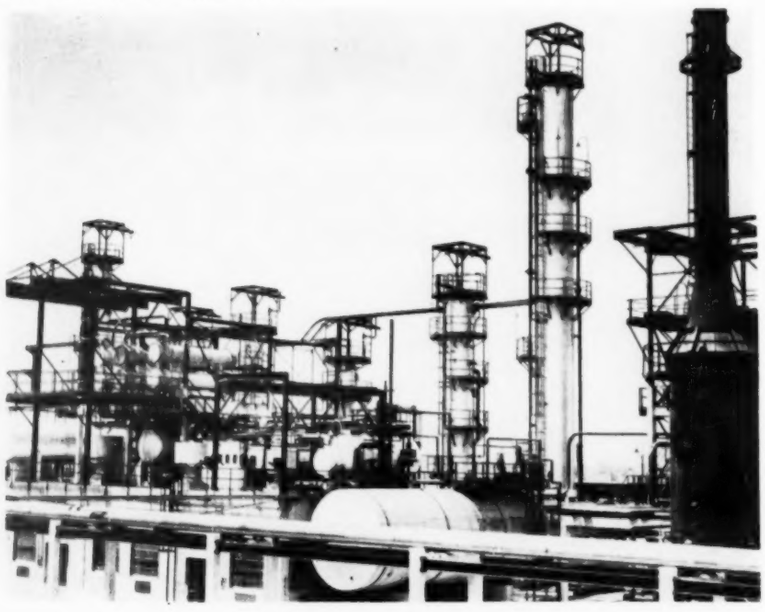
The feed to the hydrogenation stage is crude *oxo* product which has been freed of cobalt and neutralized. Furthermore, to protect the hydrogenation catalyst, it is preferred practice to subject the *oxo* product to steam flashing at reduced pressure. In this operation, the hydrogenation feed is recovered overhead while objectionable polymeric products and other high boilers are retained as bottoms.

Supported cobalt or copper chromite are the preferred catalysts for the hydrogenation step. The latter has the advantage that small amounts of carbon monoxide in the gas phase are not objectionable. The catalyst is used in fixed-bed forms; liquid feed stock and hydrogen are introduced concurrently at the converter's top. (An alternative technique has also been employed commercially wherein supported cobalt catalyst was fed with the feed stock in the form of a slurry.)

Typically, operation in the hydrogenation stage is at 250 C and 3,000 psig. Heat removal is necessary, and this may be accomplished by use of a shell-and-tube reactor or by circulating product through an external heat exchanger. According to Russum[7], such product recycle is also effective in suppressing the conversion of part of the feed stream to paraffins.

The hydrogenation may be carried out in one or two stages. If the latter approach is chosen, the bulk of conversion is carried out in the first stage. Following a crude separation, supported copper chromite is employed as catalyst in the final cleanup stage to yield alcohols of very low aldehyde content which are purified by final fractionation.

*Catalytic polymerization unit at Texaco's Eagle Point refinery, Westville, N. J.*



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# Review of recent USA patents on acrylonitrile

by Heinz Hienemann and Harold Shalit

THE PRESENT Patent Review is devoted to patents dealing with acrylonitrile. This compound is one of the most useful and versatile materials derived from petroleum. Its chief use is as a monomer in the preparation of polyacrylonitrile for fibers or elastomers. However, considerable amounts are used in cyanoethylation reactions for the preparation of organic chemicals and pharmaceuticals.

One of the ways to make acrylonitrile is by the reaction of acetylene and hydrogen cyanide. Most of the patents dealing with preparation discussed in this article are concerned with the acetylene-hydrogen cyanide process. Use of patents appear to be almost equally divided between polymerization and other reactions of acrylonitrile. In summary, some fifty-six patents are reviewed here, dating from early in 1956 to the middle of 1958, under the headings: Preparation, Purification, Stabilization, Polymerization, and Other Reactions.

*PREPARATION OF ACRYLONITRILE*

The preparative reaction to which most of the patents considered here were devoted was the acetylene-HCN interaction to give acrylonitrile directly. The reaction has been carried out in two ways: in the liquid phase using aqueous cuprous salts as catalysts, and in vapor phase with a solid, basic catalyst.

The first group of patents discussed are concerned with the liquid phase process. *R. E. Koons (2,744,926 to the Monsanto Chemical Co.)* suggests an improvement in the use of aqueous cuprous chloride complexes comprising continuous recirculation of the catalyst solution countercurrent to the flow of the gases. The catalyst is reintroduced into the reaction zone in the form of a liquid spray. In 2,748,156 *(R. Keller and K. Ecer to Badische Anilin-und Soda-Fabrik Akt.)* it is stated that when acrylonitrile is made from acetylene streams containing 5-10 vol.% acetylene and 10-40 vol.% carbon monoxide (as in acetylene made from partial combustion of hydrocarbons) the cuprous salt solution rapidly losses activity. According to this patent the activity is retained if the catalyst solution contains a rare earth metal salt such as a ceric or lanthanum salt. The concentrations should be between 30-40 wt.% cuprous halide and 0.5-1.5% rare earth salt, temperatures are maintained between 60-90°C, and the catalyst pH is adjusted to 0.2 to 4. *A. L. Van Amburg, Jr. in 2,748,158 (to the Monsanto Chemical Co.)* states that high acrylonitrile productivity is attained if the soluble cyanide content of the catalyst is between 0.6-1.8 wt.% of the catalyst solution. Such control is obtained by addition of HCl to the catalyst solution. According to *E. L. Carpenter of the American Cyanamid Co. (2,840,592)* the cuprous chloride solution used in the process becomes fouled by tars formed in the reaction. The catalyst solution can be regenerated by dilution with water to precipitate cuprous chloride and cuprous cyanide, the tars remaining in solution. The precipitate is collected and may be used for catalyst preparation without further purification. *D. Porret (2,763,676 to Ciba, Ltd.)* regenerates such polymer deactivated catalysts by dilution with water together with addition of a substance yielding chloride ions in aqueous solution, e.g., ammonium chloride, sodium chloride, calcium chloride, aluminum chloride, pyridinium chloride, etc. Cuprous ions are thereby kept in solution while polymers are precipitated. The copper is then separated from the purified solution as, for example, the cyanide. Another regeneration procedure is proposed by *K. M. Taylor of the Monsanto Chemical Co. in 2,748,157;* he also dilutes the fouled catalyst solution with water to precipitate cuprous chloride, which is then filtered. The salt is then washed with acetonitrile to free it of any adherent "soluble carbonaceous" material, redissolved, and recirculated.

In the cuprous halide catalyzed reaction acetaldehyde and vinylhalide formation are complicating side reactions. According to *G. L. Christopher, E. L. Carpenter and M. L. Spector of the American Cyanamid Co. (2,798,882)* such side reactions can be minimized by use of a catalyst solution comprising cuprous bromide dissolved in one of the following: a straight chain saturated amide of less than three carbon atoms, 2-pyrrolidone, 2-piperidone, caprolactam, and N-alkyl derivatives of these compounds in which the alkyl group contains less than three carbons. In *2,798,883, G. L. Christopher of American Cyanamid* claims that this same effect is obtained by having present in the cuprous halide solution 2-pyrrolidone or urea in amounts of from 0.5-25 mole % of the water content of the catalyst. Finally, *Christopher, Carpenter, and Spector in 2,798,884* claim a catalyst solution comprising a cuprous halide in an anhydrous solvent selected from 2-pyrrolidone, 2-piperidone, caprolactam, and their N-methyl and N-ethyl derivatives.

Two patents concerned with operation of the cuprous salt process are discussed below. In *2,784,214 (G. A. Akin and H. S. Young to Eastman Kodak Co.)* it is stated that the acetylene-HCN reaction is usually carried out with a large excess of acetylene to provide a stripping gas for the acrylonitrile. They propose to use HCN and acetylene in equivalent amounts together with an inert gas as stripper. *G. Manullo, U. Maffezzoni, and M. Agamennone (2,796,426 to Montecatini)* suggest that acetylene and HCN be introduced into the bottom of a lower stratum of catalyst solution at 80°C and in mole ratios of 0.8-1 mole acetylene per mole of HCN. The excess acetylene diluted with inert gas is introduced higher up the catalyst column where the temperature is maintained at 80°-100°C.

The other important acrylonitrile process in the following group of patents is the vapor phase reaction of acetylene and HCN. *J. F. Gabbett and N. C. Robertson (in 2,762,834 to the National Research Corp.)* react acetylene and HCN over a catalyst made by deoxygenating at 500°C an unactivated charcoal with hydrogen. This is then impregnated with an alkali metal hydroxide, cyanide, or carbonate. When the process is carried out at 500-700°C, it is claimed to give high yields of acrylonitrile and low yields of propionitrile. In *2,780,639 (T. R. Steadman and J. F. Gabbett to Escambia Chemical Corp.)* dilute acetylene streams, such as those obtained from the Wulff and Sachse Processes, are reacted with excess HCN in mole ratios of 2:1 to 1:1 hydrogen cyanide over acetylene. The catalyst used is a supported alkali hydroxide, cyanide or carbonate, and temperatures are 450°-700°C. It is stated that the excess HCN causes most of the acetylene to react and minimizes acetylene loss. A catalyst for the vapor phase reaction is prepared according to *J. F. Gabbett, Jr. and N. C. Robertson (2,780,640 to the Escambia Chemical Corp.)* by deoxygenating carbon by hydrogen treatment at 500°C. This material is then impregnated with alkali hydroxide, cyanide, or carbonate, and the whole reacted with HCN at about 500°C until the recovery of HCN in the off gases is greater than 80%.

*F. Maslan and E. A. Stoddard, Jr. of the Escambia Chemical Corp. (2,847,446)* propose a method of operation of the vapor phase process comprising reacting a dilute acetylene stream, containing less than 15% acetylene, with less than stoichiometric amounts of HCN. This step is carried out at 450°-700°C over a catalyst made by supporting an alkali hydroxide, cyanide, or carbonate on an inert support. To the resulting reaction mixture HCN is added in excess over the remaining acetylene, and the gas mixture passed over additional catalyst. In *2,847,449, F. Maslan and E. A.*

*Stoddard, Jr.* (*Escambia Chemical Corp.*) introduce a mixture of acetylene and HCN into a reactor containing a supported alkali hydroxide, cyanide, or carbonate at 450°-700°C. One, or both, of the reactants at temperatures above 450°C is added at a number of points along the length of the reactor to control the temperature. *T. R. Steadman and L. H. Sutherland in 2,847,450* (*to Escambia Chemical Corp.*) suggest a catalyst preparation for the vapor phase process comprising treatment of unactivated charcoal with 1.5-10 wt.% of an alkali metal. In a somewhat different approach *H. Anderson, E. A. Asendorf, and H. Berstoff* (*2,789,126 to Deutsche Gold-und Silber-Scheideanstalt*) carry out the acetylene-HCN reaction by passing the gases at 450°-700°C countercurrent to a moving bed of catalyst. It is claimed that better temperature control is obtained and that continuous use of uncarbonized catalysts allows better conversions.

*T. R. Steadman and J. F. Gabbett, Jr.* (*2,847,447 to Escambia Chemical Corp.*) propose as an improvement to the vapor phase process that the reactor be constructed of an iron-aluminum alloy on surfaces contacting the reactants. The same inventors also propose (*in 2,847,448*) that the reactor be constructed of copper or its alloys with zinc, tin, or nickel on surfaces contacting reactants.

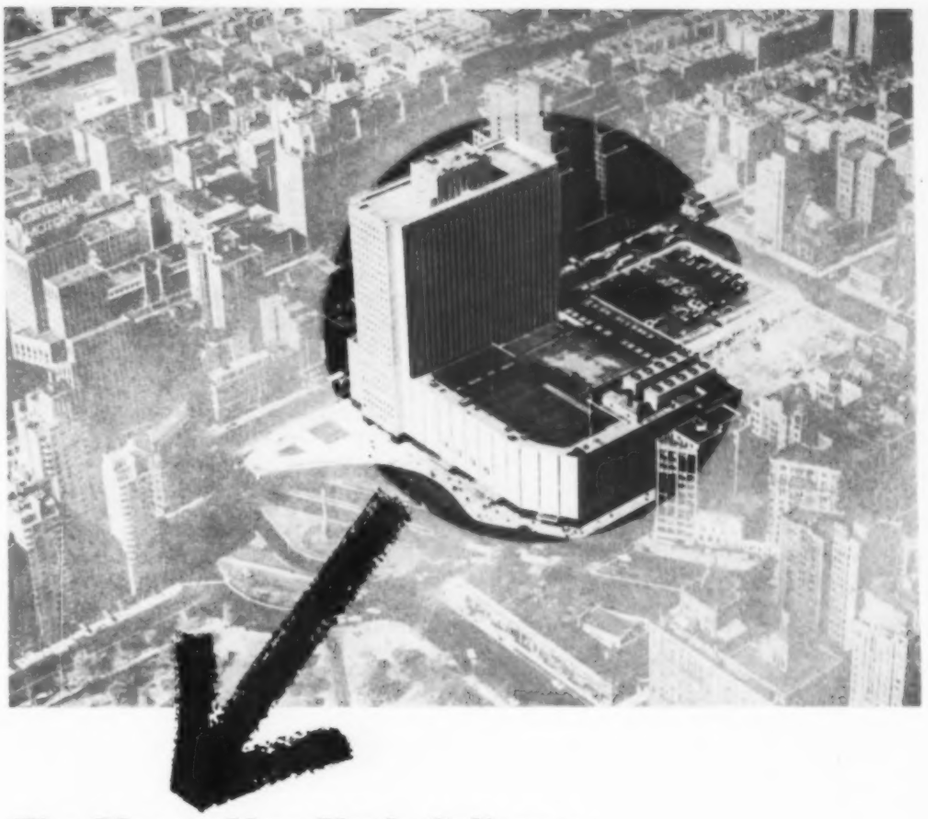
Acetylene streams from the Wulff or Sachse processes contain oxygen which is detrimental to the vapor phase acrylonitrile process. *J. F. Gabbett, Jr. and T. R. Steadman* (*2,805,244 to Escambia Chemical Corp.*) propose to remove the oxygen by passing the gases over charcoal heated to temperatures between 175°C and those at which acetylene oxidizes. Such a procedure effects substantially complete removal of the oxygen.

The next two patents deal with other acrylonitrile processes. *W. J. Sander and W. L. Fierce* (*2,803,641 to the Pure Oil Co.*) make acrylonitrile by reacting an acyclic, saturated hydrocarbon, containing at least two carbon atoms, with nitric oxide in the absence of oxidizing agents. The reaction is carried out at temperatures above 500°C and in the presence of a silica-alumina catalyst. In *2,832,798, L. Rapoport of the American Cyanamid Co.* proposes to make acrylonitrile from β,β'-oxydipropionitrite by contacting this latter compound with a salt which in aqueous solution shows an alkaline reaction, e.g., sodium formate, sodium acetate, sodium phosphate, etc. The reaction temperature is 180°-220°C.

*PURIFICATION OF ACRYLONITRILE*

The chief reactions of acrylonitrile include polymerization and cyanoethylation; for both of these reactions, and especially for polymerization, quite pure acrylonitrile is needed. Much attention, therefore, has been paid to separation and purification. The group of patents discussed in this section deals with this subject.

*M. Borrel* (*2,739,930 to Societe Industrielle des Derivative d l'Acetylene*) claims

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**The Time:** ***May 31 - June 5, 1959***
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to purify acrylonitrile of acetylenic polymers, mainly divinyl acetylene, by reacting the mixture with nitrosyl chloride. The acetylenic materials react selectively with this reagent, and acrylonitrile may then be distilled from the resulting mixture. *Borrel, in 2,768,941*, removes dienic materials, such as cyanobutadiene, divinyl acetylene, etc., by reaction of the mixture with dinitrogen tetroxide in sufficient quantities to destroy the impurities. In *2,782,148, M. Geiger of Ciba, Ltd.* removes divinyl acetylene from acrylonitrile by extractive distillation with water. *G. Marullo (2,799,630 to Montecatini)* proposes to remove acetylenic impurities by selective hydrogenation of the impurities over Raney cobalt, Raney nickel, platinum, or palladium. The conditions given are room temperature, 1-20 atmospheres of hydrogen pressure, and 30-60 minutes reaction time.

Removal of cyanide impurities is the subject of the next two patents. In *2,772,304 (U. Meffezzoni and F. A. Luzzi to Montecatini)* acrylonitrile is freed of HCN and lactonitrile by treatment at temperatures lower than 70°C first with aqueous ferrous sulfate and then with aqueous alkali. The amounts of treating materials used should be equivalent to the HCN in the acrylonitrile, either as free HCN or as lactonitrile. The product of the reaction is an alkali ferrocyanide. The resulting mixture is separated into two phases, with acrylonitrile in the upper phase. *A. Sadle of the Allied Chemical and Dye Corp. in 2,793,227* removes such impurities by treatment with 1-5% caustic solution followed by a flash distillation.

A group of patents was devoted to removal from acrylonitrile of methylvinyl ketone, a product of the acetylene-HCN reaction. *D. W. McDonald (2,784,216 to Monsanto Chemical Corp.)* performs such purification by treatment of the mixture with an alkali or alkaline earth hypochlorite. *R. L. Maute (2,784,217 to Monsanto)* uses reaction of the mixture with 2,4-dinitrophenylhydrazine in the presence of mineral acid to precipitate the ketone. *McDonald (2,784,218 to Monsanto)* employs aqueous sodium bisulfite. The bisulfite solution should contain five parts by volume of 1 molar sodium bisulfite and one part by volume of 1 normal sulfuric acid and is buffered to a pH of 6-8. It is claimed that cyanoethylation is minimized by these conditions. *McDonald and K. M. Taylor of Monsanto in 2,770,645* treat the mixture with an alkali, alkaline earth, or ammonium bisulfite to precipitate methyl vinyl ketone. *M. L. Owens, Jr. in 2,770,644 (to Monsanto)* precipitates the ketone as the oxime with hydroxylamine hydrochloride.

*F. Derbenwick and A. W. Jefts (2,798,035 to the American Cyanamid Co.)* claim to refine crude acrylonitrile containing acetaldehyde by distillation in the presence of free HCN in excess of that necessary to react with the contained acetaldehyde. It is stated that fouling of the column is thereby prevented. In *2,836,614 (T. Bewley to the Distillers Co., Ltd.)* it is stated that, when acrylonitrile is made by reaction of ammonia with an unsaturated aldehyde or alcohol, the partly purified product contains unsaturated aldehyde and HCN as impurities. The crude product is purified, according to this patent by causing the aldehyde and HCN to react to form a condensation product which can be separated from the acrylonitrile.

When the dilute, aqueous acrylonitrile solution obtained from the acetylene-HCN process is steam stripped to concentrate acrylonitrile overhead, foaming of the solution causes excessive amounts of water to be carried overhead also. According to *2,758,072 (L. H. Sutherland and C. C. Rolland to American Cyanamid Co.)* the foaming can be prevented by having present in the solution a small amount of tri-2-ethylhexyl phosphate. *C. Pyle and G. M. Turner (2,777,807 to du Pont)* accomplish this end by adding near the top of the stripping column at least five parts per million of tricresyl phosphate based on the combined amounts of acrylonitrile and water fed to the top of the column.

*N. C. Robertson (2,807,573 to the Escambia Chemical Corp.)* claims to separate acrylonitrile from acetonitrile by subjecting such mixtures to extractive distillation in the presence of oxygen. The solvent used is an aqueous solution of an alkali metal salt, with the water concentration in the liquid phase being maintained above 70 mole %. Acrylonitrile is removed overhead as a water azeotrope; acetonitrile is separated as an aqueous solution in the bottoms.

### *STABILIZATION OF ACRYLONITRILE*

Acrylonitrile, being a polymerizable compound, is subject to deterioration when shipped or stored for any length of time. It is necessary to incorporate stabilizers into the nitrile before shipment to prevent unwanted polymerization. *L. J. Couvillon (2,784,219 to the Monsanto Chemical Co.)* suggests, as a polymerization inhibitor, an N,N-dialkyldithiocarbamic acid in which each alkyl group contains between 1-8 carbon atoms. *F. Applegath and R. A. Franz, also of Monsanto, in 2,847,452 stabilize* α-β unsaturated nitriles by addition of at least 0.5 part per million of a secondary or tertiary amine and at least 10 parts per million of acetaldehyde.

### *POLYMERIZATION OF ACRYLONITRILE*

Acrylonitrile finds its chief use as a polymerizable compound. Many interesting fibers and elastomers have been made from polyacrylonitrile. The following group of patents discusses various aspects of acrylonitrile polymerization. Many more patents are issued on this subject than are listed here; however, these were chosen as representative of the group.

In *2,740,773 (G. E. Ham to the Chemstrand Corp.)* it is claimed that heat stability is imparted to polyacrylonitrile fibers by polymerizing the monomer in the presence of 5-50 wt.% of a halogenated alkyl nitrile. The alkyl group may be a mono-, di-, or trihalogenated group with 1-17 carbon atoms, and the halogen may be fluorine, chlorine, or bromine. According to *K. K. Kurtz (2,793,199 to American Cyanamid Co.)* heat control during polymerization is maintained by withdrawing unreacted gases, cooling them, and reintroducing them into the reactor. However, during such operations the cooling heat exchanges are fouled by the polymerizable gases. Such fouling is prevented by injecting into the stream of recycling acrylonitrile oxygen, nitrous oxide, or nitric oxide. These materials are added in amounts between 0.005-0.05 cubic feet per pound of polymerizable gas. *H. Hopff and K. Jost (2,831,827 to Badische Anilin-und Soda-Fabrik)* claim to produce dyeable copolymers by heating a mixture preponderating in acrylonitrile with minor amounts of 1-vinyl imidazole, 1-vinyl alkyl imidazole, and other 1-vinyl imidazoles. The heating is carried out in the presence of a free radical polymerization catalyst. The flex and impact strength of acrylonitrile-styrene interpolymers is improved according to a patent by *A. J. Haefmer of the Ethyl Corp. (2,833,746)*. The inventor incorporates into the interpolymer 10-30% of isobutylene, the other ingredients then being 40-80% acrylonitrile and 5-45% styrene. Another terpolymer composition is claimed by *F. R. Millhiser (2,837,501 to E. I. du Pont de Nemours)* to impart improved dyeing characteristics to acrylonitrile fibers. His formula contains a major amount of acrylonitrile with minor amounts of a vinylarene sulfonic acid, or water soluble salt thereof, and a vinyl monomer different from acrylonitrile. *F. M. Rugg and J. E. Potts of Union Carbide Corp. in 2,841,569* prepare a thermoplastic composition having physical properties improved over polyethylene. These improvements are obtained by graft polymerization of acrylonitrile on the polyethylene.

### *OTHER REACTIONS OF ACRYLONITRILE*

Acrylonitrile is reactive compound, undergoing many interesting and useful conversions other than polymerization. The versatility of this compound is illustrated in the following group of patents which describe some useful reactions of acrylonitrile.

*H. G. Metzger and F. J. Held of B. F. Goodrich Co. (2,759,016)* prepare alkyl acrylates by mixing acrylonitrile, a mineral oxy-acid, and a polymerization inhibitor. The acid content should be between 1.5-2.5 moles per mole of acrylonitrile. The mixture is fed into consecutive reaction zones maintained at 130°-155°C in the first and 120-180°C in subsequent zones. An alcohol is continuously vaporized into the reaction zones countercurrent to the flow of the mixture. *J. J. Healy, Jr. in 2,816,135 assigned to the Monsanto Chemical Co.* claims a one step process for the production of alkyl acrylates from acrylonitrile. This comprises reacting acrylonitrile with an alkyl hydrogen sulfate in the presence of water at temperatures from 60°-120°C. The alkyl

group should contain 1-8 carbon atoms.

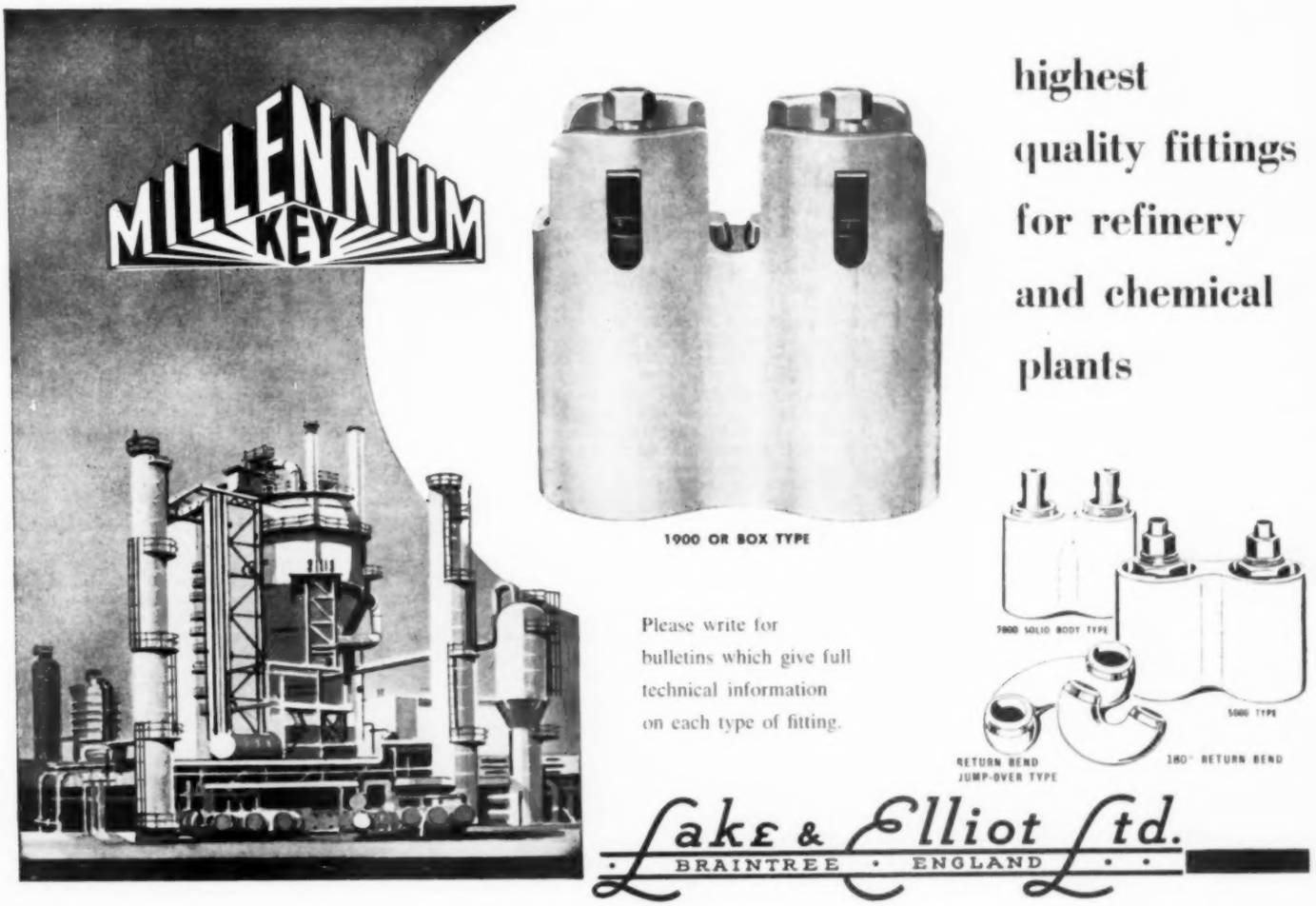
One of the products formed by reaction of acrylonitrile and water is β,β'-oxydipropionitrile, a highly polar compound useful mainly as a solvent. According to *W. H. Selcer and D. D. DeBorde* (*2,816,130* to *Monsanto Chemical Co.*) the oxydipropionitrile produced by ordinary methods has a difficultly removed red color. These inventors have found that by careful control of reactant ratios and temperatures such color formation can be obviated. Acrylonitrile and water in ratio of four moles of nitrile per mole of water are refluxed at temperatures below 75°C in the presence of an alkaline catalyst. Unreacted acrylonitrile is flashed off, the residue filtered, and light colored product is recovered from the filtrate. In *2,837,567* (*K. M. Taylor to Monsanto Chemical Co.*) β,β'-oxydipropionic acid is prepared by passing anhydrous hydrogen chloride into a mixture containing β,β'-oxydipropionitrile, four moles of water per mole of dinitrile, and enough 1,2-dichloroethane to dissolve the diacid formed. Ammonium chloride is removed and the solvents are distilled off to recover the diacid.

The reaction of acrylonitrile with ammonia, analogous to that with water, produces a series of β-cyanoethyl amines. *P. D. Montgomery of the Monsanto Chemical Co. in 2,816,129* patents an improved process for the production of tris (β-cyanoethyl)-amine. His invention comprises reacting acrylonitrile with ammonium acetate in aqueous methanol at temperatures from 25°-85°C. Yields of product in the examples shown in the patent are around 30%.

The reactions just discussed are examples of cyanoethylation, other compounds, also, can be cyanoethylated with acrylonitrile or its derivatives. *G. E. Journeay* (*2,790,818* to *Monsanto Chemical Co.*) claims to cyanoethylate mercaptans with β,β'-oxydipropionitrile in the pressence of a strongly alkaline catalyst. The *same inventor in 2,790,821* also cyanoethylates hydrogen sulfide using the same reagents. In *2,837,551*, *V. B. Jex and J. E. McMahon of Union Carbide Corp.* suggest a method for the preparation of β-cyanoethyl trichlorosilane. They react acrylonitrile with a polychloropolysilane, e.g., hexachlorodisilane, by heating to a temperature sufficiently high to cause the compounds to react.

*J. A. Brockman and P. F. Fabio of the American Cyanamid Co. in 2,837,556* claim to prepare 2,3-dihydroxypropionitrile by oxidation of acrylonitrile. The oxidizing agent used is an aqueous solution of a permanganate salt in the presence of a mineral acid. The dihydroxy compound is an intermediate in the synthesis of the essential amino acid, serine. END

*The Puri No. 1 well of Australasian Petroleum Co. in Papua, about 220 miles northwest of Port Moresby: APC is a joint undertaking of the BP Exploration Co., Vacuum Oil Co. Pty. Ltd., and Oil Search Ltd. This well recently flowed about 1,000 b/d for mixed distillate and oil, according to press reports in London.*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# INTERNATIONAL NEWS AND NOTES

### Syrian Oil Organization

According to Nur al-Din Kahhalah, president of executive council in Syrian region and deputy minister of public works and planning, an oil organization for exploration in Karatchuk field will be completed shortly, and that repayment of shareholders of dissolved Menhall oil company still are being studied. Government wished to assure UAR citizens of early receipt of their rights.

### Syrian Refinery

Cairo press reports Syrian minister of land reform to effect oil refinery will be established at Karatchuk to supply Jazirah region farmers with cheap oil products at early date.

### Shell in Australia

Shell group has purchased two-sevenths interest in West Australian Petroleum Pty. Ltd., owned by Caltex and Ampol. Caltex will hold four-sevenths, Ampol one-seventh. Amount paid by Shell is not known.

### USSR Oil Exports Rise

Oil exports by USSR recently have been published and show a very sharp rise of 47% yearly, including both crude and products. 1957 exports were 13.7 million metric tons (274,000 b/d) compared with 10.1 million in 1956. Part of rise is due to Suez crisis. Source of data is Soviet official foreign trade magazine *Vneshnyaya Torgoviya* (*Foreign Trade*).

### Russians Find Oil in India

According to K. D. Malaviya, Minister of Mines and Oils, about a year will be needed to establish commercial significance of Russians' oil find at Lunej, near Cambay, in southwestern India. He stated "about a dozen horizons" had been found with oil or gas shows in Jwalamukhi, the other area where Russians are drilling in the northwest of the country, and three horizons had been found at Cambay. Two more drilling rigs are to be installed. First rig has been moved about a mile away, and is beginning a new well. Drilling is slow, estimated to take about 10 months.

### Bid for Egyptian Rights

Shaw Oil Co., a Dallas, Texas, independent producer, and African Oil Fields, a local Egyptian company, have bid on concession areas in parts of the Sinai peninsula and Red Sea coastal area. Terms reportedly are similar to those of the Sahara Petroleum Co. concession, recently surrendered by Sahara Petroleum.

ENI, Italian government company, is bidding on the area surrendered by Sahara Petroleum Co., according to Cairo papers (Cairo daily *al-Akhbar*, Oct. 28, 1958).

### Netherlands Refinery

Construction has started on Esso's $50 million refinery near Rotterdam. Scheduled for 1960 completion, capacity will be 95,000 b/d.

### Australia's Oil Supplier

Indonesia has replaced Iran as Australia's main source of oil. During 1957-58, Indonesia supplied 671 million gallons to Iran's 644 million. In 1956-57 Indonesia's total was 524 million gallons against Iran's 579 million.

### Kuwait Gas Compressor

Kuwait Oil Co. will put in operation by mid-1959 what will ultimately be one of the largest gas compressor plants in the Middle East. First stage will comprise of two compressors, each driven by a gas turbine of 7,000 hp. Total volume of gas to be compressed and injected into Burganfield formations will be about 100 mmcf per day.

After sufficient study of the first plant's operation, a second plant of equal capacity is planned.

### Japanese To Explore Qatar

Japan has offered to explore offshore Qatar. Offer was made by Japanese ambassador to the UAR. Terms would be same as for Kuwait-Japanese contract.

### Hungary Recovers Production

Production in the first nine months 1958 in Hungary was up to 16,400 b/d. Though well below the high of 31,800 b/d, it represents a recovery from losses of the past two years during anti-communist revolution.

### Polish Refining

Refining of 160,000 b/d of USSR crude in Poland is planned by 1975 in a refinery to be constructed with Soviet aid. Initial capacity of 40,000 b/d is to be stepped up in stages to 1963-64.

### Pakistan's 26th Dry Test

Pakistan Shell's exploration well at Giandari in District Dera Ghazi Khan reached final depth of 12,007 ft in September. Testing was completed October 14. At 6,000 ft, the well showed salt water and gas, and it was abandoned October 16. Giandari was the 26th dry exploration well in West Pakistan since 1955.

### Pakistan Invites Participation

At invitation of government representative, Italian oil delegation was in Pakistan recently to discuss possible Italian investment for development of East and West Pakistan. Pakistan has invited both French and Italian participation. French are interested primarily in a proposed refinery.

### New Law For Sahara

France's new oil law for the Sahara, designed to give the go-ahead signal for intense research and oil development in the desert on an international scale, has received cabinet approval.

### ENI For Saudi Operation

Ente Nazionale Idrocarburi (ENI), the Italian government's oil agency, appears likely to operate the first new concession in Saudi Arabia. Italian recipient of the concession is SANE, a company owned by Italian government through Monte Amiata and SICEA, two other government companies which have, respectively, 36.88% and 63.12% of SANE's stock. Since SANE has no oil exploration experience and ENI is the government's oil agency, it appears likely ENI will operate the concession. Area involved is about 34,750 square miles along Red Sea coast south of Jidda, off northwestern Assir province, including Farsan Island group near Yemen border.

### Japan Producer

Seventh well in Japan's new Tamugiuama field, Niigata prefecture, came in flowing 629 b/d.

### Iraq Cancels BP Concession

Government of Iraq has terminated British Khanaqin Oil Co. (British Petroleum) concession, and will take over company's oil fields. Concession was to have ended in 1996.

### To Drill In Lower Austria

An early joint test well is to be drilled near Texing in the Scheibbs area of Lower Austria by the government's OeMV and British Petroleum.

### Papuan Success

Australasian Petroleum Co. Pty. (Stanvac and BP) brought in first oil producer in Papua after 20-year $67 million search—first success in 19 wildcats drilled in 11 years since World War II. No. 1 Puri tested initially about 1,000 b/d of crude and condensate, with increasing amounts of water. Oil- and gas-bearing limestone was at approximately 7,400 ft.

### Trinidad Duster

Standard of California's wildcat in Gulf of Paria, Trinidad, was abandoned dry at 10,814 ft. Drilled by Dominion Oil Co., Baton Rouge, La., it is believed deepest test ever drilled from a floating barge.

### Sicilian Gas Discovery

No. 1 Montoni natural-gas discovery on Fiume Platani permit in Sicily by company owned jointly by Gulf Oil and Montecatini tested 2.8 million cubic feet daily. Evaluation will be by another test soon to be drilled on adjoining Alimena permit.

### Finland To Take Soviet Oil

Gulf and Shell will be forced to cut their deliveries of oil some 3 1/3 million barrels in next year and half in Finland. Shipments will be displaced by Russian oil so Finland will be able to reduce her ruble holdings.

### UAR Consumption

London press reports Egyptian inland oil consumption now amounts to more than 3.5 million tons per year, and last year included 25,600 tons of avgas, 261,000 gasoline, 668,000 kerosine, 532,000 gas oil, 1,850,000 tons fuel oil. Under terms of trade agreement between Soviet Union and UAR, with some West German technical assistance and equipment on credit, local refining facilities are to be expanded. Program includes two one-million-ton crude distillation units at government's Suez refinery (where through put in 1957 was 836,000 tons), 60,000-ton-per-year lube plant at Suez, and 300,000-ton plant for high-octane gasoline and petrochemical feed stock.

### Erratum

World Petroleum, November 1958, p. 106, carried item "Kenya's 2,000 b/d Refinery." This is incorrect. Luanda is not in Kenya, but in Angola. The item refers to Luanda refinery in Angola.

### East German Refinery

Russians have been in East Berlin to make preparation for large refinery, subject of recently signed 1959 German-Soviet trade pact. Plant is to be located near terminus of Russian-East German pipe line through which Soviets expect to pump 100,000 b/d by 1965.

### New Libyan Test

Between its No. 1 Bahi and No. B1-32 Dahra, Oasis Oil Co. expects to spud a third wildcat in Libya as soon as testing on first two wildcats has been completed. During 1959 it expects to move two or three new rigs into Libya.

### Iraq Oil Sales

Negotiations are under way between Iraqi government and IPC for revision of period of notice required for government to exercise its option to sell its share of next year's oil production. Under 1952 agreement, government is allocated one-eight of each year's estimated production which it may sell directly to any customer it wishes at whatever price it can obtain. Government must give IPC six month's notice of its intention to exercise option. Oil has not been sold in the past because government was unable to find profitable customers, but sold oil back to IPC. *London Times* reports that presumably a potential market has been opened up in government-to-government transactions with Iron Curtain countries. Direct sales to China and Yugoslavia are talked of.

### Greek Refinery Onstream

New $26 million refinery at Aspropyrgos near Athens, Greece, has gone onstream. For 10 years it will be operated by Oil Transport Trading & Refining Co. (largest interest Niarchos); Socony Mobil will supply it with Persian Gulf crude.

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### New Zealand Shale

Otago Development Council of New Zealand is sending oil shale to the USA for bulk testing in Union Oil Co.'s retorting plant. Union, which tested some oil shale from New Zealand, has indicated a commercial retorting plant could be designed to handle this shale. If bulk tests bear this out, Union Oil experts will be invited to discuss the matter in detail. Union Oil has indicated an interest in considering financial participation in a New Zealand company to work the deposits.

Deposits of oil shale estimated at 2,000 million long tons, each ton estimated to contain about 13 imperial gallons of oil, are located in the Nevis Valley near Cromwell.

### India Against Private Aid

The Indian Prime Minister categorically brushed aside, at a recent press conference, the plea that private enterprise should be allowed to enter the field of oil prospecting with the remark: "They will then ask us for a large loan."

### Indian Refinery, Romanian Credit

Under an agreement between India and Romania for a 40,000 b/d refinery "in Assam in the public," sector, India will obtain a long-term credit of about $11 million (Rs 52.4 millions or £4 millions) to cover the cost of plants, technical services, and supplies for the project. With interest at 2½%, this credit is repayable in installments before December 1965; 15% is repayable in six installments between now and the commissioning of the refinery, and the remaining 85% in 10 installments between December 1961 and December 1965. Romania will buy Indian goods against its credit as far as possible, but the unused balance will be convertible into transferrable free currency after April 1961.

Romania has undertaken to design the refinery, supply equipment and materials, provide the necessary technical assistance in the construction and erection, train Indian technicians (in designing, erecting, and operating the refinery) in Romania, and put the refinery into operation. Present hopes are the refinery would be onstream by April 1961. The Indian government will be responsible for selecting the refinery site, collecting the necessary data, furnishing all facilities for construction. It will also be responsible for construction and erection of the refinery with the assistance and supervision of Romanian engineers.

### USSR's Foremost Oil Region

Discovery of two more oil deposits in Tataria-at Yelabua, on Kama River, and at Yamashiy—bring the number of known deposits in Soviet Union's foremost oil-producing republic to 27.

### Poland To Get More Soviet Gas

By year-end 1959, USSR gas deliveries to Poland will be doubled. USSR gas deliveries between November 1958 and March 1959 will amount to 4.4 billion cubic feet, somewhat less than a third of Poland's requirements.

### Polish Gas Area Yields Crude

A well at Partynia, between Mielce and Radomysl, southern Poland, has produced oil in a region hitherto yielding only gas. It is on test after having yielded seven tons of crude. The recently discovered Lubaczow gas deposit has now been estimated at 158.9. billion cubic feet.

### Refinery For Albania

Albania's 1961-75 five-year plan envisages one more refinery. Present two plants, at Cerrik and Stalin, process only 65% of Albania's current annual crude production of 490,000 tons; rest is exported. Crude output by 1960 is to be two million tons.

### Czechs To Up Crude From USSR

Converting more and more from coal hydrogenation to oil refining, Czechoslovakia plans to raise crude imports from the Soviet Union to 5.5 million tons by 1965 and 11.7 million by 1975. From 1961 on crude is to come by pipeline from USSR.

### Moroccan Bids Overlap

Soc. Marocaine Allemande du Petrole—formed jointly by German firm Wintershall AG and Tangier-based Sahara Mourakouch—has applied for total 14,730 square miles in two tracts, one of 4,500 in central Draa River valley, the other of 10,230 square miles in zone of Taouz oasis. Tracts are in disputed southeastern border region of Morocco and Algeria. Two unidentified French companies have bid on same acreage applied for by Ambassador Oil Corp., of Fort Worth, Texas. Latter covers 15,400 square miles stretching across zones of Hammada du Draa, Kem-Kem, and Hammada du Guir.

### Hungary To Up Production

Vienna sources report Hungary's oil production is to be increased 80% by 1960—with Nagylengyel fields extended and drilling to start in Somogy area. The Hungarian government has granted a 1.8 million sterling subsidy to raise production to meet increased gasoline demand resulting from rapid development of motorization.

### Iran Offshore Site

Geological staff of SIRIP (NIOC-Agip) has decided on site of first exploration drilling offshore Iran, which had been scheduled to begin first quarter of 1959. SIRIP will employ American LeTourneau drilling barge, with base camp near port of Korramshar.

### Iran's NIOC Turns Down Bids

National Iranian Oil Co. officially called for new bids on oil areas in Districts I, III, and IV on which oil rights have not been granted so far. NIOC recently turned down a new bid from Dutch-Shell group and SNSJ which had offered a $30 million bonus for part of remaining acreage in District I, without NIOC participation. Subsequently these companies announced they would not submit new proposals.

### Indian Oil Corporation

The Oil and Natural Gas Commission has recommended to the Indian government the setting up of an autonomous oil corporation for the Cambay oil region. The corporation will function as a subsidiary of the commission, and will obtain all technical assistance from the commission on a contract basis for proving and exploitation of oil in the Cambay region.

### Shell In Australia

Negotiations have been reached whereby a Royal Dutch-Shell company would acquire an interest equal to each of those of California Asiatic Oil Co. and Texaco Overseas Petroleum Co. in the oil exploration activities of West Australian Petroleum Pty. Ltd. which holds exploration permits over nearly 300,000 square miles in Western Australia. This venture has already cost more than 14 million Australian pounds. New arrangement will give Shell another opportunity to participate in the continuing endeavor to find oil in Australia. A readjustment of interests will be necessary to accommodate Shell. However, relative to each other, the proportionate interests of California Asiatic Co., Texaco Overseas Petroleum Co., and Ampol Exploration Ltd. in the venture will not be affected; Ampolex will hold one-seventh and the others two-sevenths each.

### USSR Planned Gas Output

The newly discovered gas field at Gazla in Bukhara-Khiva depression (Uzbekistan), estimated at 45.9 trillion cubic feet, reportedly is largest in USS. Uzbekistan's planned 1965 gas production of 635.6 billion cubic feet is to reach 1,942 billion by 1975. The Ukraine, at present producing one-third the Soviet Union's gas output, is to treble its gas output by 1965—to 1,094.6 billion cubic feet—by exploiting 27 new gas deposits.

### Nigerian Success

An oil show has been reported in a Shell-BP wildcat at Uquo, Eket division of Calabar province, eastern Nigeria, 70 miles east of Port Harcourt. Drilled to 10,350 ft, testing continues.

### Gives Up In Egypt

After spending $35 million on 4½ years of effort without success, Sahara Petroleum Co. (Continental Oil Co.'s Egyptian subsidiary) is suspending operations in Egypt's western desert. Sahara Petroleum has a 30-year concession on 90,000 square miles. Other participants are Ohio Oil, Cities Service, and Richfield.

### New Oil Policy For Syria

A new oil policy reportedly is being prepared for Syria. No details on the changes planned are known.

### Canadian Refinery

Fluor Corp. Canada has been awarded a contract for a $1 million 3,000 b/d refinery and treating plant at Edmonton by Alaska-Yukon Refiners & Distributors Ltd.

### Africa-Europe Pipeline

Consultative Assembly of the Council of Europe has unanimously approved a project to pipe natural gas to Europe and North Africa from the northern Sahara. Plan calls for a vast pipeline network running through Algeria and Morocco, crossing the Mediterranean at Gibraltar and spreading to Spain, France, Belgium, the Ruhr, and Britain.

### New Company For Papua Search

Proposed new company would raise $11.2 million in Australia to continue Papua oil research which already has cost more than $65 million. BP and Stanvac, major partners in the operating companies—Australasian Petroleum and Island Exploration—have agreed in principle to cut their holdings in the operating companies to 50% from 90%. Oil Search Ltd., with 10% interest in venture, made the proposal following announcement by BP and Stanvac that they would not contribute additional capital.

### Austrian Search

British Petroleum and Austria's OeMV have announced they will begin joint exploratory drilling in Southwest Austria. Geological research already has been carried out.

### Forms Buying Partnership

TIFCO International Corp., Houston, has joined forces with Coordinadora de Inversiones Nacionales y Extranjeras, Bogota, Colombia for the purchase of equipment required in Latin American oil installations.

### Paris Basin Extended

Cie. d'Exploration Petrolière (CEP) has announced an oil strike at Chailly, 40 miles southwest of Paris. If productive, this will be third Paris basin find.

### Gives Up In Somaliland

Conorado Petroleum Corp. is giving up its exploratory acreage in Somaliland Protectorate (British Somaliland).

### Neutral Zone Expansion

American Independent Oil Co. (Aminoil) has announced completion of its Neutral Zone expansion program, including a 30,000 b/d refinery onstream in September; new 12-in. pipeline from Wafra field to terminal; new pumping station at Wafra with four 1,000-hp units; new storage facilities for 1,800,000 bbl; new tanker-loading berth for 100,000 dwt tankers served by 24-in. submarine line and loading pump station for 15,000 bbl per hour at new berth, 10,000 bbl per hour at old.

### Indian Oil Lab

The Indian government has decided to construct a modern oil research laboratory and a colony at LUNEJ (Cambay) at a cost of about $300,000 (Rs 1,300,000). The laboratory will cost about $120,000 (Rs 550,000), with the colony costing $180,000 (Rs 750,000).

### UAR Oil Authority

Decree of September 28, by UAR President Nasser sets up independent "General Petroleum Authority" to plan United Arab Republic oil policy. With headquarters in Cairo, there are subsidiary departments for Egypt and Syria. All negotiations will go through it—including oil pipelines, imports and exports, prices of oil products, and exploration activities. It will also "guarantee a State's right in respect of amounts due to it from these countries." It will also conduct exploration, refining, or other oil operations and have authority to buy, incorporate, and annex public or private oil organizations. (Source: Beirut dailies *al-Tallighraf* and *The Daily Star*, Sept. 30; London daily *The Financial Times*, Sept. 30, via *Middle East Econ. Survey*, Oct. 3.)

### Middle East Completions

Oil companies planned to complete 240 wells in Middle East during 1958, compared with 200 in 1957 and 164 in 1956. Substantial increase in production is seen for 1959, especially as 55 of these wells are in Kuait and 27 in Saudi Arabia. Number of wells is small compared with USA, but average production from each well is more than 5,000 b d, and less than one well in every six proves a dry hole.

### Austrian Settlement

One of the most controversial issues of the *Vienna Memorandum* of May 10, 1955, the restitution of the French pre-World War II interest in the Schwechat refinery, near Vienna, has finally been settled. The French claim of the Ste. Franaise Industrielle et Commerciale des Pétroles (SPCIP, now called Ste. Finançière et Industrielle des Pétroles—FIP) valued at 50 million schillings ($2 million) has been compensated by the transfer of 51% of the shares of Donau Insurance Comp., held by the Austrian government, to FIP. Another 15.9% of the shares of the Donau Insurance Comp. in the value of 12 million schillings ($480,000) will be sold by the government to a puchaser to be named by FIP.

### Heads Argentine Petroleum Inst.

Bernardo Rikles, a well-known figure in Argentina's oil industry since 1922, has been elected head of the Argentine Petroleum Institute, the Instituto Argentino del Petróleo. His oil career stretches back to 1922, when he was appointed technical translator by YPF, the government's oil company, following his graduation from the University of Colombia. He received his degree in petroleum engineering from the University of Pittsburgh after working for one year at Gulf Oil Corp.'s Port Arthur refinery. He later purchased YPF's first refinery, and was supervisor of refinery operations and assistant manager of the manufacturing department there. He resigned in 1946 under the Perón regime, but in 1949 was called back as consultant for the National Power Bureau, and in 1951 was appointed a consultant to Empresas Nacionales de Energia.

Mr. Rikles has written number of technical articles and books on petroleum refining. He is a member of the American Chemical Socy., The Institute of Fuel of London, Centro Argentino de Ingenieros of Buenos Aires, Argentine Scientific Socy., Argentine Socy. for the Advancement of Science, etc. He has been working with *World Petroleum* for nearly 15 years as its Argentine correspondent.

Other officers of the Institute include: vice president, Dr. Altavino E. Catinari; secretary, Eng. José F. Soler; assistant secretary, Eng. Martín T. Aranguren; treasurer, Eng. Edgardo Rambelli; assistant treasurer, Emilio Begher.

### Zeppa Heads AAODC

Joe Zeppa, president of Delta Drilling Co., Tyler, Texas, was elected president of the American Assn. of Oilwell Drilling Contractors at the annual meeting in Dallas, October 2. He succeeds J. U. Teague. Brad Mills, who has been executive vice president of the association for the past 18 years, announced he wishes to retire as soon as his successor can be found. During his term of office the association has grown from a membership of 10 to more than 950.

*B. Rikles*

*J. Zeppa*

Association vice presidents for the new year include: George P. Livermore, Livermore Drilling Co., Lubbock, Texas; Ray Wiley, Ray Wiley Drilling Co., Carmi, Ill., H. Don Johnson, Carl B. King Drilling Co. of Texas, Midland; Morris McDannald, Mac Drilling Co. Houston; Frank G. McClintock, Zephyr Drilling Corp., Tulsa; F. M. Stevenson, Signal Drilling Co., Denver; William D. Tetsch, Terminal Drilling and Producing Co., Los Angeles; Don Slape, Don Slape Drilling Co., Olney, Ill.; A. Earl White, Mustang Drilling Corp., Tyler, Texas; E. F. Fullen, Mallard Well Service, Lafayette, La.; M. G. Rowe, Rowan Drilling Co. Inc., Fort Worth Texas; W. W. Hawkins, Win Hawkins Drilling Co., Lafayetie La. Secretary-treasurer is W. L. McClusky, of M. J. Delaney Co., Dallas.

### Egyptian Pipeline

A pipeline in Egypt linking Alexandria with Cairo is planned, according to Cairo weekly *Akhir Sa'ah* (via *Middle East Econ. Survey*). A number of Russian "oil experts" are discussing development projects with the government.

### Caltex To Spain

Caltex is reported negotiating through an affiliate to prospect for oil in northern Spain, according to Spanish sources.

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## World Petroleum Congress

*(Continued from page 56)*

cussed. The areas include Sicily, Oman, Hadhramaut, India, Turkey, Israel, Iran, Pakistan, Argentina, Brazil, Holland, Venezuela, the Caribbean, the Soviet Union, The Belgian Congo, French Equatorial Africa, Austria, Yugoslavia, Canada, and the United States. In addition, the almost incalculable reserves contained in the tar sands of Alberta, Canada, will also be given attention.

Petroleum and natural gas are now the source of about 80% of all organic chemicals produced in the USA. This being so, it is highly appropriate that petrochemicals should be given an important place on the congress program. Authors from 10 countries are presenting 31 papers in the section dealing with this subject.

There will be four general lectures by persons of international repute in the oil industry. L. F. McCollum, president of Continental Oil Co., will talk on oil's contributions to mankind in the past and what is expected in the future. Roger Buttin, Ste. des Pétroles d'Afrique Equatoriale Française, will speak on recent oil discoveries in Africa. Dr. Karl Ziegler, of the Max-Planck Institute in Mülheim, Germany, will discuss the new organometallic catalysts for petrochemicals manufacture. The fourth lecture by Colonel S. J. M. Auld, of the American Locomotive Export Co., London, will emphasize the importance of employing standardized testing methods on a worldwide basis.

There will also be three symposia, each lasting a day, which will focus discussion on the definitions and characterization methods for oil-bearing mother rocks; progress in sedimentology; and the viscosity-temperature relationship of lubricating oils.

END

### DUPONT TECHNOLOGY

*The Story of Technology*, a 36-page booklet in pictures and text published by E. I. duPont de Nemours & Co., Wilmington, says industrial technology is advancing so rapidly it could well "reshape the world in a single generation." Many technical problems are still unsolved, and to meet these needs hundreds of billions of dollars will have to be invested in research, and development, and production. The booklet describes Dupont's contribution to technology.

**R. C. ADAM**, manager of operations at Magnolia's Beaumont refinery, moved to Dallas, January 1, into a newly created executive position in charge of economics for Magnolia Petroleum Co.

**JOHN R. SUMAN**, petroleum consultant of Houston and former vice president of Standard Oil Co. (New Jersey), has been named by American Standards Assn. as the 1958 recipient of its Howard Coonley Medal, annually awarded to an executive who has rendered great service in advancing the national economy through voluntary standardization.

*J. R. Suman*

*R. C. Adam*

*The "Orient Explorer" was launched at Southampton on October 13, 1958. Designed by the DeLong Corp. of America and built by Steel Structures Ltd. of Southampton, the platform, when fitted out, will be towed to Borneo for drilling in high-seas areas. It will be hired to Brunei Shell Petroleum Co. Ltd., and will be used to continue exploration drilling off the coast of British Borneo. Shown is the hull of the DeLong platform immediately after launching. The deck house, on top of which the helicopter platform will be mounted, will provide airconditioned accommodation for the drilling crews and other personnel.*

### RICHFIELD PETROCHEMICAL DIVISION

Richfield Oil Corp. has announced formation of a new petrochemicals department, as part of the manufacturing and transportation department headed by Richfield's vice president David E. Day. Heading the new department is C. A. Day. Mr. Day will be succeeded as manager of research and development by Dr. L. M. Richards. C. D. Thurmond, formerly in charge of market research, will move to the new petrochemicals department.

### GREECE STUDIES OIL LAW

Greece prepared a draft oil bill for submission to the Parliamentary Recess Committee. The draft petroleum law vests all exploration and exploitation rights with the State, which may exercise them for its own account or grant them to other parties under concession or contract agreements ratified by Parliament. The lease period is 30 years, and can be extended for another 10 years if regular production is established. The area under lease cannot exceed one million stremmas (one acre equals 4.1 stremmas).

Agreements will be subject to performance bonds during a two-year exploration stage, which can be extended for two more years and then two more years for a total of six years, if required drilling is done. Afterwards the exploitation stage begins with the concessionaire free to extract and sell production at his discretion. The rental paid by the lessee is scaled in accordance with yearly production, and ranges between 2% and 25%. The bill also specifies that foreign capital brought in to implement agreements will enjoy the provisions of the 1953 Foreign Investment Law.

State Department officials have advised John Lambroukos, Secretary General of the Ministry of Coordination, that the services of "an experienced consultant is generally advisable" in drawing up a petroleum law, and has submitted Libya, Turkey, and Guatemala as examples of countries which have recently passed effective petroleum legislation.

*The New York Chapter of NOMADS held its usual November party in the Palm Terrace of the Hotel Roosevelt. Guests are shown (seated left to right): C. A. Doh, Schlumberger Wells Surveying Corp.; B. Beverly, Arabian American Oil Co.; W. G. Clark, Standard-Vacuum Oil Co.; J. R. Stubbins, Oficina Tecnica Stubbins CA, Caracas, Venezuela; P. Swales, Sui Gas Transmission Co. Ltd., Karachi; J. J. Rice, Drilling & Exploration Co., Brazil; Geraldo O. Penna, Chicago Bridge & Iron Co., Brazil. Standing left to right are C. M. King, Baker Oil Tools; G. H. Ratcliffe, Shell Co. de Venezuela; S. Baker, Cameron Iron Works; R. Gaylord, Wagner Morehouse Inc., Los Angeles; J. W. Boswell, Boswell International, Tokyo, Japan; J. C. Robbins, Iran Oil Co.*

*C. B. Barry*

*J. A. Richardson*

### BARRY & RICHARDSON

Charles B. Barry, Tulsa, and J. A. Richardson, Dallas, have formed a consulting engineering firm with Tulsa headquarters. The new firm will offer a complete range of engineering services as process and evaluation specialists to the petroleum, natural-gas, and chemical industries. Both partners have had extensive oil and engineering company experience.

IMPROVING OIL RECOVERY, by Producers Publishing Co., Box 141, Bradford, Pa., for the University of Texas: A series of compiled lectures given at the University of Texas by a number of authors. Available for $2.50 plus 25¢ for postage and handling.

### INDIANA SECONDARY RECOVERY

SUMMARY OF SECONDARY-RECOVERY OPERATIONS IN INDIANA TO JANUARY 1957, 12-page booklet with maps and tables, has been published by Interstate Oil Compact Commission, P. O. Box 3127, Oklahoma City 5, Okla. Report includes data on 36 projects now active in the state, with total secondary recovery during 1956 of 4,925,000 bbl.

### FORM INTERNATIONAL CONSULTANTS

An international consulting group, known as E. B. Noble and Associates, welds together unusual geological experience in the international field. It consists of Earl B. Noble, a consultant for about seven years and formerly petroleum consultant with the National City Bank of New York, manager of exploration for Union Oil Co. of California, and AAPG president; Thomas W. Koch, who spent 15 years in domestic and international exploration for Standard Oil Co. of California and its subsidiary and an equal period for Superior Oil Co. as chief geologist; Lloyd H. Metzner, who has 21 years' experience as geologist and petroleum engineer, as assistant chief geologist for Signal Oil and Gas Co.; and Leo van der Harst whose background includes geological and geophysical work in Holland for SSL, for Caltex in Indonesia, and recently as senior geologist and assistant to T. W. Koch in Superior's international geological department.

The group offers its services to the industry as engineering and geological consultants in domestic and international exploration, exploitation, and evaluation.

*API TECHNOLOGY SCHOOL: Oil-industry production men from all over the world recently gathered at Harbison-Fischer Mfg. Co. in Fort Worth, Texas, for one of two plant tours as part of a six-week refresher course in production technology, sponsored by the API, the University of Texas, and Kilgore (Tex.) College. Later in the day the men visited the Otis Engineering Corp. plant in Dallas. Shown in the photograph are men with the Creole, Socony-Mobil, and Shell in Venezuela; Kuwait Oil Co.; Apex in Trinidad, as well as many domestic personnel. At left, as he welcomed the group, is L. B. Harbison, sales manager for the pump firm. The room is Harbison's office, adorned with firearms, antique powder horns, ammunition displays of the 1800's, game trophies and other Old West bric-a-brac.*

*C. J. Bender*

*W. R. Wallace*

### Dallas Tank-Trinity Steel

Dallas Tank Co. and Trinity Steel Co., both Dallas plate steel fabricating firms, were merged, effective November 1, 1958. New company will be known as Trinity Steel Corp. Inc., with the Dallas Tank custom division handling refinery, chemical plants, gasoline plants, and other plate steel fabrications built to customer's specifications.

C. J. Bender will serve as chairman of the merged companies. W. Ray Wallace, president, will actively conduct the administrative duties, assisted by Ray L. Reedy, LPG Division, and E. O. Haltom, Sr., custom division.

### White Motor Staff Changes

Formation of a new sales engineering department at the White Truck Division of The White Motor Co. has been announced. It will be headed by William L. Peterson. Assigned to the same new department is V. C. Speece who will manage field engineering activities.

### White Diesel Catalog

White Diesel Engine division of the White Motor Co. has published *Bulletin No. 106* to give performance characteristics of 26 Superior engine models, offering a range of 200-2,150 bhp and 150-1,500 kw, naturally aspirated or supercharged, and operating on natural gas, diesel, or dual fuel. Copies are available from Dept. 712, White Diesel Engine Div., Springfield, Ohio.

### Buckeye-CBIC Merger

Buckeye Pipe Line Co. and Chicago Bridge & Iron Co. have announced formation of a jointly owned company called Buckeye Tank Terminals Inc. New company will construct, own, and operate terminal tankage on the Buckeye Pipe Line system, or at other locations; and will lease or otherwise arrange for use of those facilities by a specified individual customer.

Buckeye Tank Terminals Inc. is headed by Charles Ashmun, formerly assistant to the president of Buckeye Pipe Line Co. Headquarters for the new firm are at 30 Broad Street, New York.

### Hall For International Harvester

Willard F. Hall has been named assistant sales manager of International Harvester's construction equipment division. Mr. Hall, who had been central region sales manager of the division for the past three years, began his IH service at the Minneapolis district office in 1939.

### Hurley Joins Welex

H. B. Hurley, for many years an executive with Continental Oil Co. and more recently senior vice president of Republic Natural Gas Co. in Dallas, has joined Welex Inc. as assistant to the president.

### Mid-Continent Supply Promotions

T. P. Tarwater has been elected vice president and R. C. Holden and W. S. Jones have been promoted to key positions by Mid-Continent Supply Co. Mr. Tarwater will have charge of Mid-Continent sales operations in West Texas, New Mexico, and the Rocky Mountain areas. R. C. Holden will be assistant division manager at Tulsa, and W. S. Jones was promoted from assistant to manager of the used equipment department.

### Milwhite Builds In Houston

The Milwhite Mud Sales Co. has started construction on administrative and general offices and laboratory costing in excess of $500,000, George E. Conners, executive vice president announced recently. The new facilities will be located in the 3900 block of Essex Lane.

The new building which will contain 20,000 square feet of floor space, in addition to replacing administrative offices now located in the Bank of the Southwest Building, will house modern and research laboratories.

### Welex Appointments

New assistants to the vice president of sales of Welex Inc. include: G. K. Harcourt and J. W. Lyon, for Houston. Promoted to the same position in Tulsa is R. B. Burns. Mr. Harcourt has had 10 years' experience in oil-well service work, and has been with Welex for one year. Mr. Burns has been with Welex for the past nine years.

### Norway's Refinery Storage

Graver Tank & Mfg. Co. Inc. has been awarded a contract to build all the storage tanks for the largest refinery in Norway, now being constructed by an affiliate of Standard Oil Co. (New Jersey).

The refinery—first complete one ever built in Norway—is under construction on a 600-acre site in Slagen on the west side of the Oslo Fjord, 50 miles south of Norway's capital city. Graver will start erecting tanks in spring of 1959, and the entire project is for completion in 13 months.

### Milwhite Adds New Adsorber Line

The Milwhite Co. Inc., of Houston, Texas, will introduce new high-efficiency acid-activated clay adsorbents for petroleum refiners about January 1, 1959. The company has contracted Morton Chemical Co., and will manufacture these adsorbents by a Milwhite process from montmorillonite clays. The clay-activation unit is now being erected by M. W. Kellogg Co. at Weeks Island, La. It was engineered for Milwhite by Kidde Processing Co., of Pasadena, Calif., and is the first acid-activation plant in the USA to employ hydrochloric acid, which has the inherent advantage of purity of product.

### Hughes Engineering Unit

To speed up and expand product development, Hughes Tool Co. has created a product observation division within the product engineering department. R. R. Aulick, who for the past several years has headed activities of the sales engineers in Hughes' northern region, heads the new division as manager. His headquarters will be in Houston.

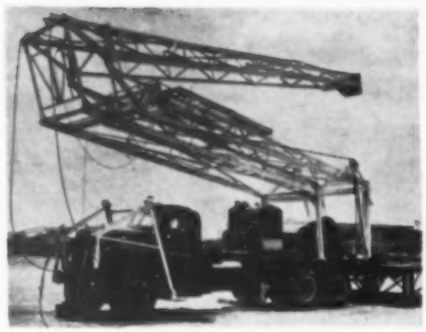
Initial assignments to the new product observation division include the following regional field engineers: W. A. Kistler, Jr., to Midland, Texas; A. G. Rollow to Oklahoma City; R. D. Jones to Wichita Falls, Texas; R. O. Bredthauer to Houma, La.; Joseph A. Kloesel, Jr., to Farmington, N. Mex.

*W. F. Hall*

*H. B. Hurley*

*R. R. Aulick*

*J. Woade*



*A truck-mounted drilling rig, with a "grasshopper" type folding mast, has been designed for the Lardarello Co., of Pisa, Italy, by Lee C. Moore Co., the mast is 70 ft high, with a gross capacity of 200,000 lb, but can be folded down over the truck to comply with the 13-ft 1-in. height limitation set by the Italian government on motor vehicles. The mast has a 6-ft spread at the bottom, and tapers to the top. It is hinged both at the bottom, and the middle, permitting the top section to be folded down over the bottom section, which is folded down over the truck. When partially raised, the mast resembles a giant grasshopper.*

### Baroid Changes

Baroid Division National Lead Co. has announced appointment of W. T. Sherman as district superintendent, at Brownfield, Texas. W. E. Pierce has been transferred to Monahans, Texas, as district superintendent. C. L. Apple has been transferred to Baroid's well logging department at Houston.

### Byron Jackson Elections

E. S. Dulin, president of Byron Jackson since 1929, has been elected chairman. Andrew W. Rose succeeds him as president and chief executive officer.

Under Mr. Dulin's almost 30 years of leadership, Byron Jackson has added to its basic pump and oil-tool manufacturing such new operations as electronics, nuclear equipment, oil-well services, and industrial rubber products. The company became a division of Borg-Warner in September 1955. Mr. Rose, who became the fourth president of this 86-year-old California-founded firm, has been vice president and assistant to the president since September 1957.

### Hydraulic Dual Operation

Axelson Manufacturing Co. recently announced a new method of dual-zone operation utilizing a double-piston surface hydraulic pumping unit which reciprocates two sucker-rod strings. These separate rod strings terminates at different depths utilizing standard-type subsurface pumps.

### BJ Service President

John B. Merritt has been named president and chief executive officer of BJ Service Inc., a Borg-Warner subsidiary. Mr. Merritt has been executive vice president and general manager of BJ Service since 1951. He began his career within the Byron Jackson organization in 1941.

### Clark-Turbine Booklet

Just published by Clark Bros. Co., one of the Dresser Industries, *Bulletin 167* details operating experience with the Mark TA 750/1,000-kw gas turbine. Salient design features, types of fuels (natural-gas, distillate, crude-oil) plus applications in oil fields and process industries are discussed. Also included is an assessment of the integrated turbine-boiler package and likely future trends in turbine application. Copies of *Bulletin 167* may be obtained by writing to Clark Bros. Co., Olean, N. Y.

### Blaw-Knox Overseas

Organization of a new affiliate, Blaw-Knox Chemical Engineering Co. Ltd., with headquarters in London, has been announced by Blaw-Knox Co., Pittsburgh. Administrative head of the new company is John Woade, appointed managing director. Mr. Woade joined Blaw-Knox Co. in 1956.

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